MOTOR AGE

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Number 11

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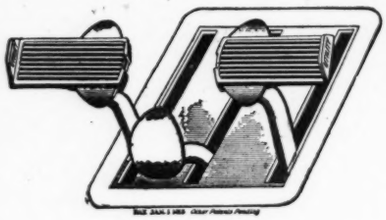

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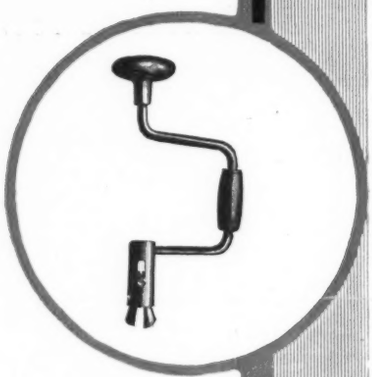

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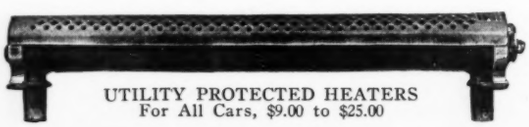

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Archer Avenue and Canal Street, Chicago
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UTILITY
Automotive Products

MOTOR AGE

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MOTOR AGE

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Enormous Demand

Quality

Dealers: Now that the automobiles have come back—now that you have looked them all over at the great shows—where else can you find such a complete combination of the highest car values as in the Velie Six for 1919?

In the Velie you offer your customers the Red Seal Continental Motor for a world of silent, supple power; Timken axles, front and rear; long, underslung springs—every feature of like character. And you offer them extra room, with deep-plaited, restful upholstery in genuine leather and curled hair; bodies in the famous, lasting Velie mirror finish—a car set apart from all its field by its rich appearance as well as its remarkable performance.

Price

The Velie Six gives you an *exceptional* price advantage. It is lower in price than any other light six of comparative specifications.

And back of this car at its attractive price is a company of unlimited resources—a great organization whose pride is centered in the utmost in car values.

Touring Cars, Roadsters, Sedans, Cabriolet and Sport Model—a complete line.

All these advantages explain the enormous demand for the 1919 Velie.

If your territory is open, ask for details of the new Velie Plan. The dealer is indeed fortunate who controls a Velie selling franchise for 1919.

Velie Motors Corporation
113 Velie Place Moline, Illinois

Builders of Automobiles, Trucks and Tractors

Velie 6

Vol. XXXV, No. 11 Chicago, March 13, 1919 $3.00 Per Year

MOTOR AGE

Placing the driveway at the side keeps the show windows together and has other advantages

Cowie's Electric Service Station

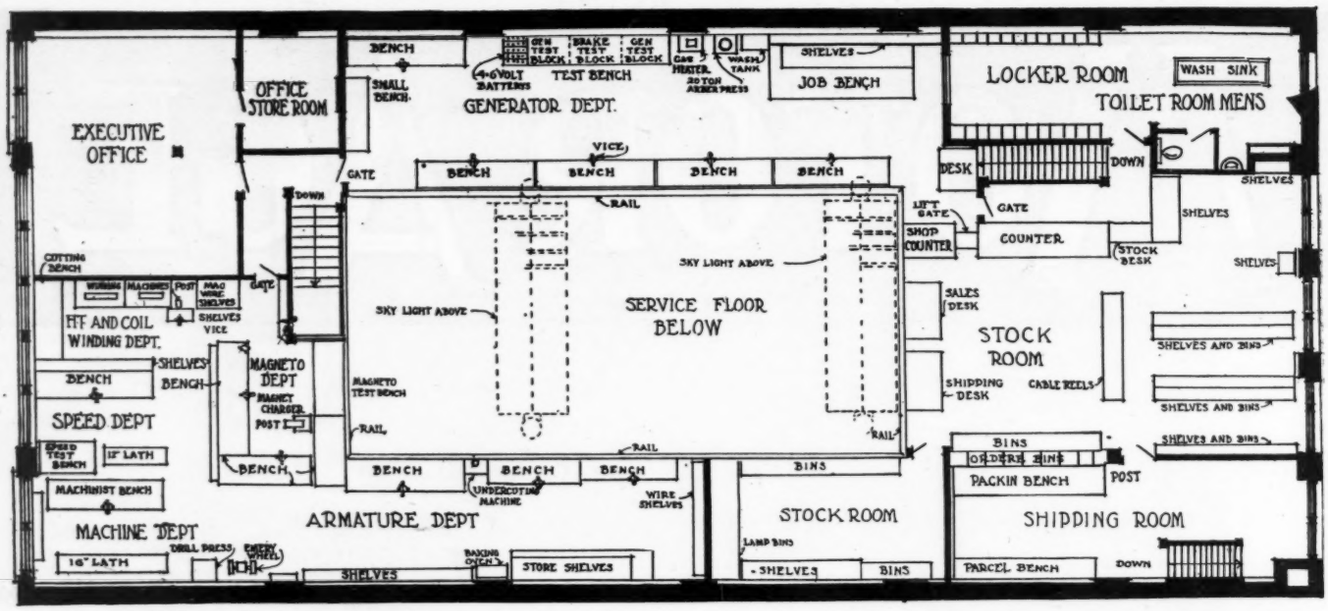
This Kansas City Specialist Has Received Inquiries from as Far Away as Maine—System and Equipment Put Him on the Map

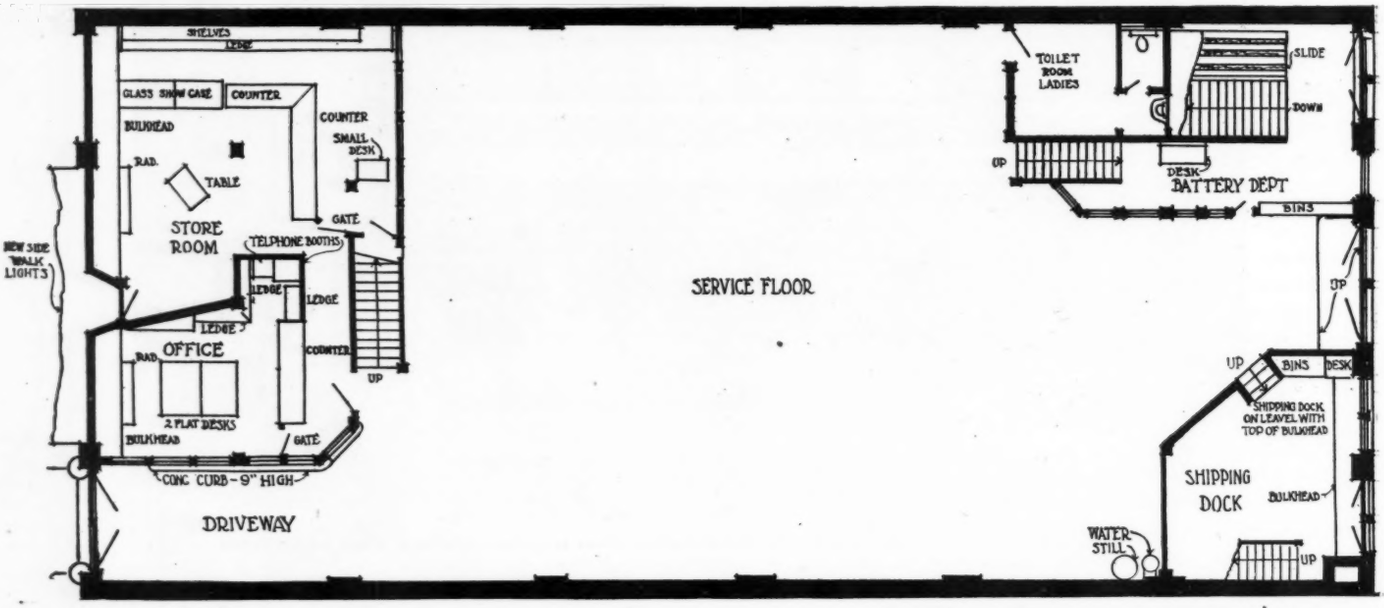
By B. M. Ikert
Motor Age Editorial Staff

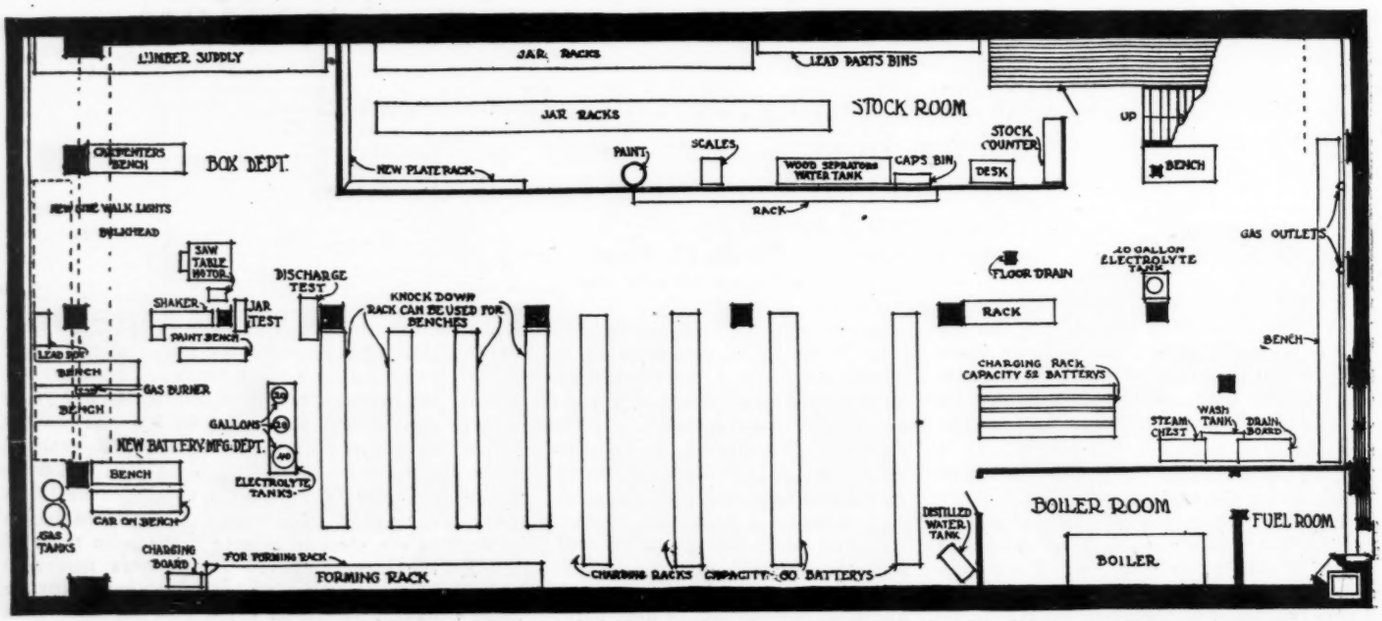
EVERY automotive dealer, whether he sells cars, trucks, tractors or farm lighting plants, knows that the biggest thing in his business, if he is getting by with it as he should in these days, is the right kind of service to customers. It is true of any business. If a motorist knows he is getting the right kind of goods, there is no doubt about his willingness to pay for it. You will always find the successful dealer is the fellow who gives his clients a heaping measure of service, though he makes them pay a good price for it.

Today we have several varieties of what might be called specialized lines of service, that is, we go to one place to have wire wheels fixed; to a tire service station to have the tires inspected or repaired, or to an electric service station for solution of electrical difficulties. In other words, few motor car dealers have an establishment sufficiently equipped with machinery and men to carry on proper maintenance of the thousand and one components of modern automotive equipment.

The electrical end of the business always has been the hardest to deal with, because few garage or repairmen know enough about the theoretical end of it. They hesitate when it comes to taking down a coil or adjusting a relay, in fact, they have not the right apparatus. Some four or five years ago the car maker, as well as the makers of starting and lighting systems, realized the great majority of garagemen and dealers were not the ones to cope with electrical equipment maintenance. Then we began to see electric service stations in most of the larger cities. The makers preferred these because they logically figured anyone having electrical experience together with the right kind of equipment was in better







Reading from top to bottom, second, first and basement floors of Cowie's service station

Every Cowie Workman Gets These Instruction Sheets

INSTRUCTIONS TO WORKMEN ON HOW TO MAKE TEST OF MAGNETOS AND HOW TO FILL OUT REPORT ON SHOP CARDS

IMPORTANT. See that type and number of machine or job corresponds with shop card. If not, call the attention of foreman to the error, as number, make and type must be on card.

1—Note customer's letter of instructions, if any, to see what trouble he claims.
2—Put on test if possible and note results obtained.
3—Note general condition of complete machine.
A—Is it complete? If not, note on card all missing parts.
B—Are there any extra parts, such as couplings, holding cap screws, advance levers, wiring? If so, note on face of shop card to insure their return with machine.
C—Note rotation and note on card.
D—Note condition of holding screws. Do they indicate that machine has been taken apart? If so, note on report.
E—Dissemble.
F—Examine breaker and ground brush (when used).
G—Note condition of points.
H—Do breaker bar and screw line up? Are parts properly insulated?
I—Refer all point replacements to foreman for instructions.
J—Note condition of winding and test same.
K—Is condenser action O. K.?
L—Has machine been properly oiled, over oiled or not at all?
M—Has armature or rotor been dragging pole shoes?
N—Note condition of bearing. This must be very carefully done. Thoroughly wash same, making sure that all foreign matter has been removed, such as grit filings, grit, etc. After having been thoroughly cleaned, examine for cracked or pitted balls, pitted races or broken cages.
O—Examine and test magnets.
P—If shuttle type, note condition of end plates.
Q—If rotor type, note condition of shoes. Are they properly pinned?
R—Assemble and adjust bearings.
S—Install breaker and timing lever and see that points open and close at the correct time in relation to armature or rotor position. This is one of the most important points. If you are not positive you have the correct setting, refer to foreman who has factory setting on the various types.
T—Test all high-tension insulation parts such as brush holders, distributer boards, etc.
U—Charge magnets, install and give running test for one hour, noting the following:
V—Does machine give good spark at throttling speed?
Does machine give good spark at full advance and retard?
W—Does machine give good spark at high speed?
Does machine give good spark at full advance and retard?
X—Do points have normal arc? (Points should arc just enough to keep themselves clean.)
Y—Make out report on back of card.

WRITE SO IT CAN BE READ

Be as brief as possible, but make note of defective or damaged parts, also appearance of machine when received.

INSTRUCTIONS TO SHOP MEN ON HOW TO MAKE TEST OF JOBS AND HOW TO MAKE OUT SHOP CARD REPORTS

IMPORTANT. See that type and number of machine or job corresponds with shop cards. If not, call the attention of foreman to the error, as number and type, also name of make, must be on card.

1—If possible, run generator as motor. Note amount of current taken and direction of rotation.
2—Check amount of current shunt field takes, if generator.
3—Note condition of bearings.
4—Note general condition of whole machine.
5—Dissemble.
6—Examine armature:
1—Does armature winding test grounded?
2—Did test as a motor indicate short-circuits?
3—Did test as a motor indicate open circuits?
4—What is condition of commutator?
5—Will it stand to be turned?
6—If undercut, does it need to be re-undercut?
7—New armature will be needed if commutator is worn beyond the point where it will not stand turning or smoothing; if laminations have been damaged beyond repair (this will be referred to the Armature Department for decision); if shaft is damaged, sprung or broken (this will be referred to Machine Department).
8—Armature may be rewound if commutator is good, if:
A—Winding is burned out.
B—Winding is grounded.
C—Winding is short-circuited.

7—Examine bearings. This must be very carefully done. If ball bearings, thoroughly wash same, making sure that all foreign matter has been removed, such as grit, filings, etc. After having been thoroughly cleaned, examine for cracked balls, pitted races and broken cages.

8—Examine field coils for grounds, open circuits, short-circuits; see that insulation is in good condition. Note if they show signs of excessive heat, as they may be burned out. A field coil burns out in the center of winding first as the heat is not radiated as quickly from the center as it is from the outside. If there is a question, untape coil to be sure.

9—Examine brush holders, brush yoke and rocker arms.

10—Examine brushes. New ones will be needed if they are oil-soaked, although they are full length. Note condition of pig tails and insulation of same when insulated.

11—All parts broken or missing must be noted on shop ticket and foreman's attention called to same.

12—No tool but the proper puller must be used to remove bearings. All burrs must be removed from shaft before pulling or replacing a bearing. Always use press for this work. Never use a hammer on a bearing.

13—After new parts have been obtained or old ones repaired, reassemble and test.

14—In making out report WRITE SO IT CAN BE READ.

Be as brief as possible, but make note of defective or damaged parts, also appearance of machine when received.

position to render service and that the management of such a place would feel more keenly the sense of responsibility than would the average garageman.

Probably few cities of this country can boast of an electric service station that can equal that of the E. S. Cowie Electric Co., Kansas City, Mo., both as to equipment and the way of rendering service. Something like five years ago this concern made its first contract to handle the service and maintenance work of one of the leading makes of starting and lighting systems. Since that time the Cowie company has been selected by fifteen of the principal makers of automotive electrical equipment for the maintenance of their products in this territory. E. S. Cowie is the balance wheel of this organization.

The Cowie company learned that the one big high spot in service work was readiness to serve. To maintain a high standard of service for automotive needs, it withdrew from the commercial electrical fields, entirely discarding a large construction and repair business. A brand new building was put up, planned especially to give quick service and tooled up so completely that the concern is conceded quite generally to have the largest and best equipped exclusive repair and supply depot for electrical supplies for automotive vehicles in this country. It has a highly trained corps of experts in all its departments. More than sixty persons are on the pay roll, more than half of whom through many years of experience in electrical repairs and testing have become criterions beyond question.

Company Makes Equipment

Naturally after several years of operating an electric service station a concern finds that certain tools or equipment are the best for speeding up service. The Cowie company has made practically all its testing apparatus and developed apparatus not obtainable on the market. Having thus evolved and perfected shop equipment for carrying on its own business, the Cowie company now makes this equipment for dealers. This can be bought wholly or in part, so if a dealer has, say, some electrical testing apparatus he need buy only such additional equipment to round out his layout. Most of this equipment was designed by B. J. Haskins, service manager.

Some of the service policies of this concern are interesting and could readily be applied by other dealers. For instance, all the magnetos or generators that leave this place are marked with an arrow on the housing, showing the direction in which the instrument revolves. One month this arrow may be painted green, the next red, then blue, etc. The reason for the different colors is this. Suppose a customer brings in a generator and says it does not work right, although he claims he had it in Cowie's place just last month. It is only necessary to check up during what month the particular color on the instrument and the company can tell exactly when the job was last in the shop. It also makes it impossible for anyone to bring in a defective generator of the same make and attempt to pass it off as the instrument originally worked on.

Like any flourishing concern, Cowie believes in advertising. Every month the

company sends out calendars to motor car owners, truck operators and farmers operating tractors, calling attention to the fact that Cowie is still on the map and ready to serve from the same platter as before. Even if the recipient chucks the calendar in the wastebasket or gives it to the baby to tear up, it has done its work. Cowie's name has been stamped in the customer's mind, and you can be sure if anything goes wrong with the electrical end of whatever he chances to drive, Cowie probably will get the repair job. During the plowing season, or, in fact, whenever the farmers around Kansas City have their tractors in the fields, they get preference over all others in service.

One of the best features of Cowie's establishment is that no job is ever held over 24 hr. The company knows from experience that it takes only from 3 to 5 hr. to overhaul a magneto, for example, regardless of condition. The same applies to generators where replacements of damaged parts are made. It does not require much imagination as to what this sort of service means to the farmers who do not care to have their tractors tied up for several days.

No Wasted Space

Careful study of the floor plans of this place shows not a square foot of space has been wasted. On the service floor the big idea is to keep the work moving. A car very seldom is held longer than a day; in fact, there is not enough room to store cars indefinitely. As soon as a car comes in either the service manager or one of the men whose work it is to remove and put back magnetos, generators or whatever is to be repaired on the car hails it instantly. These men have nothing to do with making the actual repairs and aside from doing the work mentioned render other floor service such as testing batteries, adding water to them, adjusting points, etc.

One of the first things that strikes the visitor is the orderly arrangement. The establishment has been planned so every job that comes in can be put through with the least amount of handling. Every workman is given a shop instruction sheet showing exactly the method of carrying out tests and making shop card reports. The thorough way of going at these tests is shown in the reproduction of the test sheets herewith. The stub of the shop ticket goes with the job, while the remainder goes into the files of the company for future use. The workman notes the general condition of the instrument when received and this information, together with the nature of the work done in repairing, goes on the shop ticket, so that if at any future time the same job may come in the company has a complete record.

When a job comes from the service floor to the repair balcony on the second floor the foreman decides to whom it should go, for the company has specialists in high-tension magneto, armature work or field coil-winding. The magneto, coil-winding, armature winding and general repair departments all have apparatus that speed up their particular end of the business. Much of this equipment, in fact, nearly all, has been evolved by the workmen themselves. For instance, the job of undercutting mica or commutators is usually a tedious one and often done by aid of a hacksaw blade. This is not always satisfactory, especially when done by an unskilled operator. One of Cowie's men hit upon the idea that a dentist's burr run in a dental lathe was just the thing for undercutting mica and not only does the work better but in much less time.

Here is a little wrinkle that appeals to car owners going into Cowie's place: You do not have to stand outside the door honking away for someone to open the doors on a cold day. The moment you drive up to the door the girl in the office spots you and presses a button which electrically opens the doors.

One of the things that appeals to the visitor, especially if technically inclined, is that all repair jobs are tested to run under the same conditions as they will operate in use. Thus if a generator is taken from a Packard it is tested after repairing with equipment identical with that used on the Packard car. Further, the company has exact data from the makers of starting and lighting apparatus as to the performance their products should give when in the best of shape. If the Cowie tests, therefore, do not jibe with the maker's specifications, the job again is adjusted or regulated until the results tally.

Sometimes it happens a job on which the direction of rotation is not indicated comes in. When this job goes back to the customer the direction of rotation is marked by the arrow. Of course, the company takes a chance on this being right, but if it chances to be wrong here is what happens: The user telephones he cannot get light or his generator does not show charge, etc. He is told to look at the direction in which the instrument runs and note whether this checks up with the arrow painted on the housing. If it does not, he is told to switch his generator connections and all will be well. This saves sending back the instrument. The telephone is a big service asset here.

Very often it becomes necessary to put in new parts, such as ball races, brush holders, armatures, circuit breakers, etc. The old parts are not junked immediately but placed in bags bearing the same number as the shop ticket of the job. These parts are held for sixty days, and should the owner during that time come in and want the old parts he can get them. Further, it offers a good check as to what was done to the instrument. If the owner disputes the statement that no new parts were put in, he is shown the old ones listed under the same number as his original shop ticket.

Batteries Are Made

After you have gone over the first and second floors of Cowie's place and been impressed with the spacious layout and method of rendering service you think you have seen all. But you are taken by the arm and conducted to the battery department in the basement, where not only service is rendered on batteries generally but the Cowie battery itself made from the ground up. Here we see a woodworking department, where the battery boxes are made; casting department, where the lugs, etc., are made; charging benches and test benches of all kinds. The concern is making its own battery because it believes by so doing better service is possible, not only to the consumer, but to the dealer handling it as well. Thus, by an ingenious process worked out by C. D. Barrell, in charge of the battery department, the dealer who handles the Cowie battery need handle but half the stock of extra plates and separators necessary with many of the other batteries. The wood separators are so made that they can be cut without waste, no matter what size of plate they are cut for.

A large stock of charged batteries is kept on hand for rental purposes. For identification these all are painted yellow and provided with a sort of universal terminal to fit almost any installation. The Cowie company has evolved a novel idea for checking up on its batteries regarding the last repairs. For instance, a dealer in one part of the country is provided with a steel stamp with No. 2 back of the word "Cowie." If he happens to repair a Cowie battery at any time he stamps it after the job goes out. The Cowie company has record of who the dealer with No. 2 is. Other dealers have other numbers. Should a battery be brought in for repairs and the owner says this battery was overhauled last week or last month, the stamp on the side tells who the last dealer was to open up the battery.

PEIL HEADS CHICAGO TRADE

Chicago, March 11—L. A. Peil, Mitchell distributer, was elected president of the Chicago Automobile Trade Association at the annual dinner last night. Other officers are R. C. Cook, secretary; Tom Hay, treasurer. The new directors are C. R. Dashiell, H. P. Branstetter and Charles Gambill.

The fact that the association led in the movement for shows when the manufacturers had decided not to hold them and the further fact that the association obtained $15,000 as its share of the show profits after rebating to the dealers 75 per cent of the cost of space, were important factors in building up present sentiment.

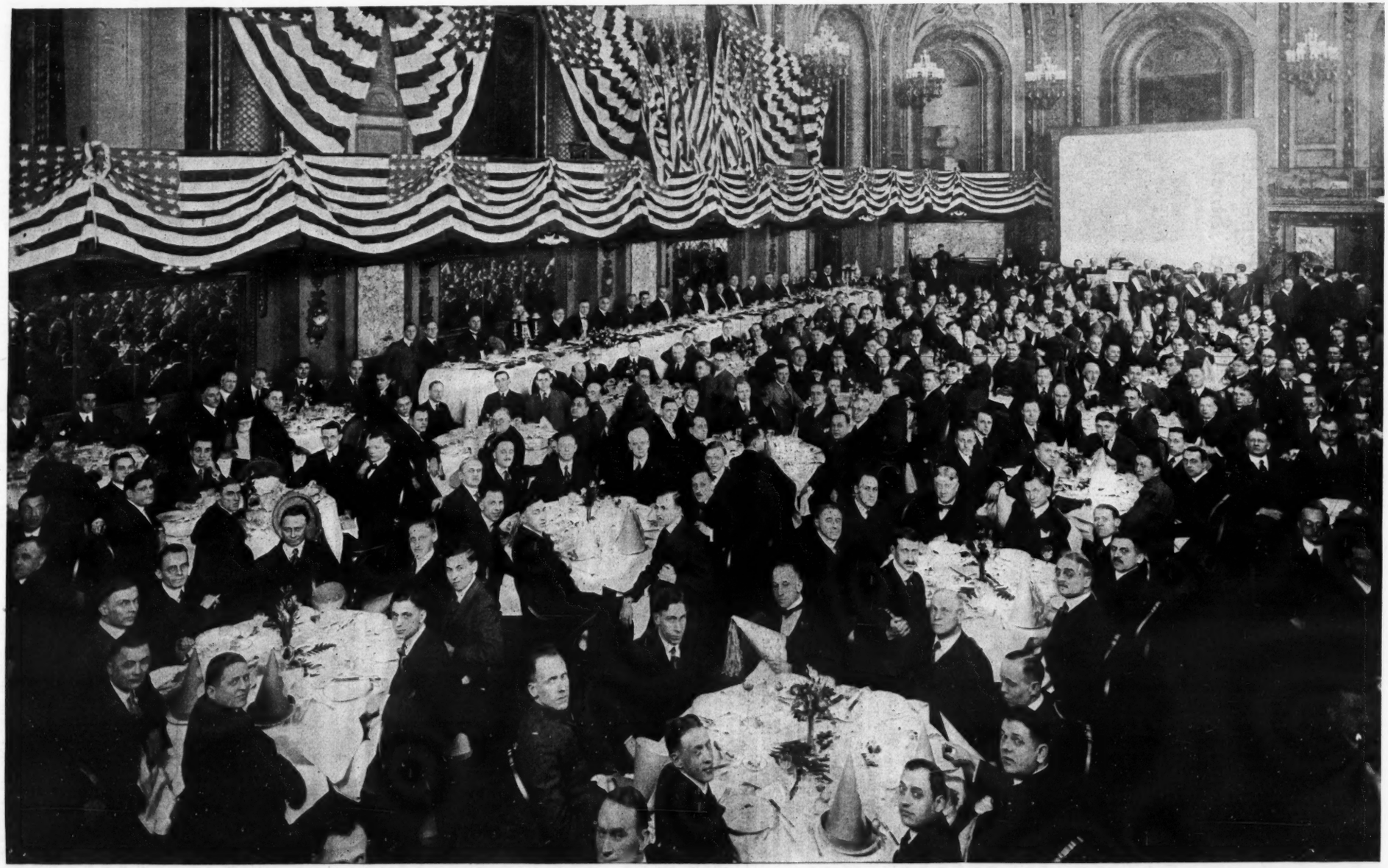
George Bird, retiring president, declared the consistent work of the association for nearly five years on the good roads movement which resulted in passing the $60,000,000 bond issue this year one of the biggest accomplishments to its credit. Henry Paulman, treasurer for many years, was given major credit.

David Beecroft, directing editor of the Class Journal Co., spoke of the trend of European design necessitated by the scarcity of fuel and he told of the part European dealers played in the war and showed that through the large repair business war conditions created some were enabled to increase their business tremendously. He cited examples where a few dealers increased from 200 to 1000 employees.

John N. Fletcher, one of Chicago's prominent bankers, talked of trade conditions in general and pointed out that the activity in the good roads movement to help the country's production.

Carl Page, New York Jordan dealer, spoke on the good roads movement and the close relationship existing between such movements and the automotive trade. He pointed out the increased possibilities of truck sales to the farmer once good roads became universal.

Chicago Automobile Trade Association Holds Annual Banquet



—Photo by Kaufmann & Fabry

The fifteenth annual banquet of the Chicago dealers was the most enthusiastic in its history. The organization did great work on the state bond issue of $60,000,000 for good roads and on the show. The result is reflected in the strength of the association. In all 350 attended

The Revenue Law Interpreted

Add 5 Per Cent to Goods on Hand and Drop Same Amount When Tax Is Repealed —Opportunity to Clean Up Old Stock

MOTOR AGE has received the reproduced letter from an Iowa dealer asking about the interpretation of the new revenue law affecting motor car accessory parts. As the questions raised doubtless are troubling other dealers throughout the country an attempt will be made to answer them as specifically as they are asked. The letter is given on this page.

First, as to what the law specifically is. It has no bearing upon the retailer of motor car accessories at all, save insofar as it affects the prices which he is to charge for his goods. The law imposes a tax on the manufacturer of motor cars, motor trucks, motorcycles, tires, inner tubes, parts and accessories. It may be divided into three parts or classifications, as follows:

1—Trucks, including tires, inner tubes, parts and accessories therefor, sold on or in connection therewith or with the sale thereof..... 3%
2—Cars and motorcycles, including tires, inner tubes, parts, and accessories therefor, sold on or in connection therewith or with the sale thereof, except tractors..... 5%
3—Tires, inner tubes, parts, or accessories, for any of the articles enumerated in 1 or 2 sold to any person other than a manufacturer or producer of any of the articles enumerated in 1 or 2 ..... 5%

As affecting the retailer, who is not at the same time a manufacturer, there is no floor tax to pay and he does not have to make a return to the Government on his sales. The stock of tubes, tires, parts and accessories held in stock by the dealer at the time the law went into effect, namely, Feb. 25, is not subject to the revenue tax of 5 per cent and can be sold by him, if he so elects, less the amount of the tax.

Legal Interpretation

A legal interpretation of the law says, however, that the dealer, "in order to save inventorying, may, if he sees fit, advance the price of such stock on hand 5 per cent to meet the new condition, but in billing his purchaser he should not include an item to cover the 5 per cent tax or bill 'to cover war tax' unless it is for goods upon which the tax has been charged to him by the manufacturer. By making such an advance the dealer would be in a position, when the war tax is finally removed and the public aware of it, to reduce the price on goods that he then has on hand upon which he has paid to the manufacturer the 5 per cent tax."

The trouble seems to be that the retailer does not quite understand that he takes no responsibility or obligation under the law. He makes no return to the Government on sales, and there is no disposition to scrutinize the prices he charges for his goods. The common-sense interpretation of the law by the legal authority quoted, as to the things which the retailer has a right to do, is based upon the assumption that at the time the tax is finally removed the dealer likely will have on hand his normal stock, upon which he has paid the tax, but upon which he must reduce the price by the amount of the tax when such tax is removed.

To protect himself against loss he can at this time advance the price on all the stock on hand 5 per cent to meet the new conditions, just as though the cost to him of his goods had been advanced an equal amount through any other cause, and thus he will have protected himself against loss at the end of the revenue period. In other words, the dealer who has a stock of parts valued at $5,000 to-day presumably will have a stock of similar value at the end of the tax period. By raising the price 5 per cent on his present stock, he can as promptly reduce it 5 per cent at the time the tax is removed, and he will have protected himself against loss. According to the authority quoted, there is nothing to prevent the dealer doing this if he chooses.

This, briefly, with some modifications to fit particular circumstances, is about what the dealers in accessories in Chicago intend to do. While there is no unanimity of opinion as to just what will be done in every case, the probabilites are that in general the price on all accessory parts will be advanced at once or soon to cover the additional cost of 5 per cent due to the tax. It is conceded generally that this is the common-sense view of the matter to take and that such a procedure will excite less comment from patrons than will any other method.

It is pointed out, however, that the way for the retailer to go about this is to figure the tax he must pay as an actual increase in the cost of the goods to him, and that on the additional cost he must figure his regular and normal profit just the same as he would if the cost to him advanced for any other reason. As one manager of an accessory store says:

Adjust Selling Price

"The dealer must adjust his selling price to every fluctation of the market anyway. If the cost of an article advances to him, he immediately raises the selling price of that article to correspond, and the raise affects not only the stock he has on hand but as well the new stock he buys. If the price falls for any reason, the course is identically the same, only in the reverse direction. The tax of 5 per cent imposed upon the manufacturer compels him to raise his price to the retailer by just that much, and this constitutes a legitimate additional cost to the retailer which he must make good in raising the selling price of his goods."

For instance: Suppose a dealer has been paying $20 for a tire, which he has been selling at an advance of 25 per cent on the cost price. His selling price therefore has been $25. Now the tax increases the cost of this tire to the dealer by 5 per cent, or $1, making its cost $21. In figuring his selling price he will figure the same rate of normal profit he always has figured, namely, 25 per cent, and the selling price will be $25.25. This, according to Chicago merchandisers, is all there is to it.

It will happen that during the time the tax is being imposed bills of two kinds will come to the dealer. One will have the prices to him revised so the new price will include the tax. In the other case the tax will be added as a distinct charge at the foot of the bill. In either case the total

What Dealer Asks

Editor MOTOR AGE—*The question of the practical application of the new excise tax as applied to automobile parts and supplies has arisen and there are a number of questions in connection with it which do not seem to be clear to the average dealer. We should like to have your opinion as to what would be the most practical way of collecting this tax from the consumer. Following are some of the questions that arise in my mind at this time:*

Should the tax be added to every little item of 50 cents or $1 which we sell, such as spark plugs, Moto-Meters, etc.? If so, I understand the tax must be 5 per cent of the manufacturer's selling price. In that case the customer will always know how much profit the dealer and the jobber are getting out of this article and which in some cases might not be desirable.

Or should the price be raised enough to cover this tax without any mention being made of the tax? If this is done and the customer asks why prices are raised so as to make odd cents, etc., and we tell him it is because of the tax, he will ask us how much the tax amounts to, and we will then be obliged to tell him and the situation will be the same as before.

Since this tax does not apply to stock in the hands of dealers before Feb. 25 and does apply to all shipments billed after that date, the customer always will be able to know how long an article has been in the dealer's stock. In the case of tires, storage batteries and some other items this is a distinct disadvantage to the dealer, because it is a well-known fact that tires deteriorate with age. A tire after six or eight months may be as good as before, but the customer is apt to object to buying it if he knows that the dealer has had it in stock that long. Also he is quite apt to think that if the dealer had the tire before Feb. 25 he might have carried it over from the 1918 season, which would make it more than one year old. Accordingly the dealer would be obliged to sell out his older stock at reduced prices in order to unload it, when as a matter of fact the goods are absolutely first class in every respect.

Also, as we are not allowed to add the amount of the tax to stock already on hand, when the time comes for this law to be repealed the dealer will be caught with a stock of several thousand dollars' worth of goods on his shelf on which he has paid the tax but on which he will not be allowed to collect from the consumer and accordingly will be left holding the sack.

On many of the smaller items where there is no fixed retail price the dealer could probably make an arbitrary price which would be great enough to make up for the tax without saying anything about the tax, but this could not be done on articles that are sold at a fixed price and advertised everywhere at that price.

amount of the bill will be the total cost, and in figuring the selling price at the normal rate of profit the dealer charges every item will be sold at a price which will include the tax.

For instance, answering the first question asked by the Iowa dealer, if an item has been selling for 50 cents, its future price must be advanced to cover the 5 per cent tax which henceforth will be imposed. There is nothing obligatory on the dealer making this advance just the 2, 5 or 3 cents to cover the tax. He can advance 5 cents if he wants to and no one will know the original cost of the article, because the net price will include the tax. The advice of accessory dealers here is that nothing need be said about the tax as a distinct part of the price; the dealer must just act upon the assumption that the price he names includes the tax and upon the assumption that the customer is aware of the same fact.

It is regarded as impracticable for the retailer to keep separate the stock he may have had on hand prior to Feb. 25 from that bought and shipped in subsequent to that date. It is the opinion of well-posted dealers that the customer will make no inquiry as to the length of time the goods may have been in stock but that he will pay the advanced price without protest and without question. He will understand that the dealer has been compelled to raise his price to meet the new situation, and he will understand also that when the tax finally is taken off the price will drop at once correspondingly.

It is suggested that if the dealer is a real merchandiser he will put the tax to good advantage to enable him to clean out old stock which he has been carrying for some time and in which he has money invested. For instance, let him do this:

In his window let him display on the one hand anything he has in the way of old stock, tires, etc. Price these less the tax. Side by side with these display some of the new goods at prices with the tax included. Call attention to the fact that the carried-over stock, just as good as new but longer in stock, can be bought as long as it lasts at a price less the tax, while the newer goods must be sold plus the tax. This will make essentially a bargain price on the old goods and clean them out. Also the dealer will have converted into cash the money he has had invested in the old goods for a greater or less length of time, and the money will be worth more to him to use in his business than the 5 per cent of the war tax. This is offered merely as a suggestion of how the up-to-date dealer can take advantage of the situation to his benefit.

12,000 AT OMAHA OPENING

Omaha, Neb., March 10—Special telegram—More than 12,000 persons—a greater opening day's attendance than ever before—attended the first session of the fourteenth annual Omaha show which is on this week at the Auditorium. A large proportion of the visitors were farmers from the nearer communities who showed marked interest in the truck display.

More than 200 motor vehicles are exhibited, the list comprising about sixty dealers. The show occupies the same quarters as last year, the Auditorium and basement, with the McCaffrey building as an annex. Decorations are in a general Pompeian style.

Thorough organization on the part of Clarke G. Powell, secretary of the Omaha Automobile Trade Association, is responsible for the fact that every exhibit was in its place and every other detail complete when the doors were opened. It was well they were for the doors had to be closed five times this evening to allow proper handling of the crowd.

Comparison of attendance with other opening days leads to confidence that this year's business should exceed that of any previous year by fully 50 per cent.

SIXTEEN IN SANTA MONICA

Los Angeles, Cal., March 10—Special telegram—Sixteen cars are entered in the 250-mile road race to be run on the Santa Monica course Saturday. The race is being conducted by the Los Angeles Motor Car Dealers' Association as one event in their campaign of activities to stimulate interest in the motor car trade. Practice began to-day, and the drivers say the course is exceptionally fast. The course has been shortened to 7 miles to make the cars pass the grandstand oftener. De Palma is here with his record-breaking car but may have to be content with exhibition driving as there is a question of the car's brakes being sufficient for right angle turns.

BOILLOT TO RACE

Paris, March 10—Special cable—Another foreign driver has signified his intention of entering the 500-mile race at Indianapolis May 31. He is Andre Boillot, brother of Georges, and will drive a Peugeot.

Dodges to Oppose Ford Plan for $250 Car

Stockholders Will Fight Withdrawal from Company

DETROIT, March 10—Neither Henry Ford nor his son Edsel, would be allowed to withdraw from the Ford Motor Co. to manufacture a cheaper car for commercial purposes and which would antagonize present Ford interests without a legal fight on the part of Dodge Brothers. This announcement came to-night from Elliott G. Stevenson of Stevenson, Carpenter, Butzel & Backus, attorneys for Dodge Brothers, heavy stockholders in the Ford Motor Co. He declares Dodges will contest Ford withdrawal to limit of law.

"There would be no attempt to keep either Ford or his son in the firm if they desire to retire, but Henry Ford is under contract to the Ford Motor Co. and he will not be allowed to leave the firm and start a competitive business," said Mr. Stevenson.

"Both the Ford genius and his name are under contract. The Ford organization will not allow him to withdraw these without legal protest, and the courts certainly will uphold the present company. Mr. Ford is also under contract to give his inventions to the Ford company. There are men connected with the Ford plant fully as competent as either Mr. Ford or his son to carry on the business, so the protest is not because of loss of their services but because of the nature of the new business in which they threaten to engage. They cannot interfere with the success of the Ford company."

In interview to-day in Kansas City Edsel Ford is quoted as saying the Fords would not dispose of their interests in the present Ford Motor Co. and then declared he did made to force minority stockholders out of the company. He would not say when he would resign from the presidency of the Ford Motor Company and declared he did not think the new company would materially affect the business of the old one. He said the new company would be owned entirely within the Ford family and thus be directed without outside interference. He added that plans for the new company, which proposes to produce a $250 car, are absolutely undeveloped but both his father and himself know in a general way what they are going to do.

Mr. Ford's decision to withdraw from the Ford Motor Co., in which he is majority stockholder, is the direct result of an adverse decision of the Michigan supreme court, which ordered him to distribute $19,000,000 in withheld dividends among the stockholders. Mr. Ford is quoted with declaring he intends to step clear of the big company entirely and that he would dispose of his interests but would not buy out the interests of the other stockholders.

All the factories will not be built simultaneously. Construction will start the early part of next year. The first three units will go up in Troy, N. Y.; Hamilton, Ohio, and Kansas City. The first factories will be complete, but later each one will be devoted to manufacture of individual parts. The present Ford system of assembly plants will be followed by the new company.

Meanwhile Detroit awaits the arrival of the Fords for its first authentic information. The Ford plan has created a great sensation in business and automotive circles. But little information is given out at the Ford factory. Ford officials were as much surprised as the general public when Henry Ford made known his extraordinary announcement. Detroit, however, is busy speculating. Car manufacturers declare Ford is preparing to tackle his greatest undertaking and there are many who declare that both Henry Ford and his millions are not big enough to swing the deal. They say grave problems face him before he can cut loose from his present company and start production for himself. Costly litigation over patents, contracts, trademarks, etc., is bound to result, and this will consume time as well as cash.

EDITORIAL

Farm Tractor Accessibility

A CAPTAIN commanding a convoy of motor trucks carrying ammunition to the batteries on the front in France said that the two prime essentials in motor trucks for such service were ruggedness and accessibility.

RUGGEDNESS was a first essential because not only engine power but ability to take an overload were of first importance. Sometimes the road was shelled and more power was needed. The truck had to stand the service. Under such strenuous conditions the ability to care for an overload was of inestimable value.

NEXT came accessibility. If a truck went wrong it had to be repaired at the roadside. That was generally not a healthy place to make a repair. Making the repair was bad enough in itself, but it was inexcusably worse if more than half the time of the repair was wasted in removing parts that simply had to be got out of the way before the repair could be made.

THIS experience can be applied to tractors. The middle of a plowed field is not the healthiest place in which to make a repair job. The shorter the time needed the better. It is still worse if part of a field of ripe grain is waiting to be cut and a storm that may beat the ripened grain into the earth and destroy much of it is brewing.

TRACTOR accessibility can be improved and will be improved. Removing the base of the crankcase is one respect in which greater accessibility is sorely needed. The trouble here is with the triangular brace rods extending rearward from the ends of the front axle. In some machines the steering linkages cross directly below the case. In others cross members have to be removed. Removing these takes perhaps as much time as taking up the bearing of the connecting rod.

THERE are tractors in which the side openings in the crankcase to reach the lower connecting rod bearings are very small. In one or two a portion of the usefulness of these openings is spoiled by the proximity of the frame. There are some tractors where there is such a literal basket work below the crankcase that to take a bearing up you would practically have to lift the engine out of the frame.

IN these transition days is the time to look to the needs of greater accessibility. When designs are being changed dealers should insist on accessibility receiving its share of attention. The service problem is up to you dealers. If you take too long taking up a connecting rod bearing due to lack of accessibility, the farmer objects to the bill and you may have to compromise. You carry the load of inaccessibility. If you have to carry the load or pay the cost, at least a part of it, why do you not keep an accurate record of the exact time needed to remove parts that interfere with repairs as well as the exact time needed in making the repair and present this information to the maker you represent? Set down in dollars and cents just what lack of accessibility costs. Endeavor to show what it costs the farmer in loss of time, loss of crops from not being harvested when they should be and also loss of morale.

Revenue Law Explained

THE dealer who handles motor car accessories need concern himself very little over the new revenue law. The tax of 5 per cent, as it is imposed on accessories, applies only to the manufacturer thereof, and he is the only interested party as far as making a return to the Government is concerned. The dealer is interested directly merely in the fact that since Feb. 25 last, and until such time as the tax is taken off, he will be compelled to pay the manufacturer 5 per cent more for his accessory stock than he did before.

THIS should be regarded by the dealer as just so much of an increase in the cost of his goods, just as if it were due to an increase in the cost of raw materials or an increase in the cost of manufacture. It should be handled by him in identically the same way. The point is, that no matter what increase the cost of goods to the dealer makes no difference to him except insofar as he must make his selling prices correspond with the increase.

ELSEWHERE in this issue this subject is handled in answer to an inquiry from a dealer, and the common sense interpretation of the law, as it will be interpreted by motor car accessory dealers in Chicago, is given. What will be the solution of the matter here likely will be the best solution elsewhere, and accessory dealers are advised to read what is said there. It will help them understand the situation better.

IN this connection it is suggested that the imposition of the tax affords the up-to-the-minute dealer with an ideal opportunity to dispose of his old stock on hand. The law provides that the tax does not apply to goods on hand prior to Feb. 25 last. By making a distinction in price between goods on hand at that time and goods bought subsequently to that date, the dealer can offer surplus stock at attractive figures and convert it into cash. Just how this might be done also is given elsewhere in this issue.

Lyons Fair Shows U. S. Tendencies

Trend Toward Standardization—One Car at $950

By W. F. Bradley
Motor Age European Correspondent

LYONS, France, March 7—Special Cable—Perhaps the most striking feature of the ninety separate motor car exhibits at the Lyons fair is the marked trend toward standardization and the use of engineering designs which long have featured American cars. But one American car, the Columbia, was actually on exhibition at the opening of the fair, though others were expected later. There are six exhibits of cars of European make other than those of French manufacture. This is doubtless due to the fact that imports of cars to France are prohibited, owing to causes that relate to internal commercial economics.

About a third of the French exhibitors are showing entirely new models. The remainder are exhibiting pre-war cars with the addition of electric lighting and starting equipment. No car shown is without a complete electrical system, although hitherto this has been either absent or, in a few cases, extra.

Car at $950

The lowest-priced car is a four-passenger exhibited by the Lyons Aviation Co. It is priced at about $950, and if 10,000 cars are sold by the end of this month it is said the price will be reduced about $40. This car is fitted with a two-cylinder, two-cycle engine with a bore and stroke of 75 by 120 mm. and a wheelbase of 123 in.

The total number of exhibitors at the Lyons Fair surpasses all previous records, with 4700. The French exhibitors predominate, naturally, with 2994, and the United States has the very creditable showing of 618.

There is a decided tendency to the use of cantilever springs, detachable cylinder heads, two-unit starting and lighting systems and spiral bevel final drive. Powerplants with the engine, clutch and gearset in unit are another feature which indicates a general trend toward American practice.

Magneto ignition is practically universal, which is far different from American practice. Detachable wheels with permanent rims of clincher type are popular, and there is considerable use of detachable steel wheels, usually of Michelin make.

In the higher-priced cars engines with six cylinders predominate practically to the exclusion of all others; there are no twelves and the only eight-cylinder is the De Dion Bouton, a model on the market for some years. The announcement has been made that Lorraine-Deitrich will build a twelve and two six-cylinder models.

The Delage, known in the United States through its success as a racing machine, has a striking exhibit of a six-cylinder model with block-cast engine and bore and stroke of 80 by 150 mm. This engine is designed to develop 70 hp. and is fitted with a starting motor operating through a Bendix drive. Brakes are fitted on all four wheels, operating on 15-in. drums and designed to stop the car in 100 yd. or less at 60 m.p.h. High-class work and refinement of detail are in evidence throughout this car, which sells in France for approximately $5,700.

Few new firms have entered the automotive industry, doubtless owing to the limitations placed on private enterprise by the universal need for the production of war munitions. An exception is that of the Voisin Aeroplane Co., which is building a car powered with a 40-hp. Knight engine. Citroen is building a light four-cylinder machine and Swiss Picard-Pictet is now backed by the manufacturers of the well-known Gnome rotary airplane engine.

Mayen, the biggest aviation engine builder in France, is producing Hispano-Suiza cars under license, and it may be said that the three most prominent European builders to-day are Peugeot, Fiat and Citroen. Much attention is being given to the production of light four-cylinder cars and it is in this connection that these three concerns are mentioned. The light-weight Fiat comes out at 1400 lb., the Peugeot at 1350 lb., and the Citroen is the same weight as the Fiat.

Although the Fiat is considered to be a popular model, in a relative sense, it is of especially high-class construction. Cylinders are block-cast and have a bore and stroke of 65 by 110 mm., heads are detachable, the crankshaft has three bearings, the power plant is a unit and lighting and starting are included as regular equipment. Final drive is spiral bevel, the wheels have detachable steel spokes and the rear axle is of full-floating type.

A new Peugeot is, in effect, an enlargement of the well-known Baby Peugeot of former years. Bore and stroke are 60 by 100 mm. and the crankcase is a single casting, the only example in the fair. This car has left-hand steering—unusual in European practice—and center control.

The new Citroen has a block-cast engine of 65 by 100 mm. bore and stroke with detachable cylinder heads. Here, again, is left-side steering featured in conjunction with center control. The crankshaft has two bearings, final drive is through Citroen herringbone gears and the rear springs are single quarter-elliptics. Double quarter-elliptic front springs are fitted, one above and the other below the axle. The price of the two-seater is approximately $1,450. In this class car the usual frame construction embodies three cross-members, the powerplant on three-point suspension.

Panhard and Levassor are producing both Knight and poppet valve models, but, except in the case of Voisin, there is no extended use of the Knight type of engine. There are no new valveless engines.

Motor firms engaged in the production of farm tractors are Peugeot, Fiat, Paris Omnibus Co., Schneider and Latil, but it is reported Renault and Panhard also are building tractors, although they do not exhibit them.

Service Questions Slow Tractor Sales

Dealer Finds Farmers Misled by Guarantee

CHICAGO, March 10—Dealers handling tractors have been looking around for various reasons why sales have been slow during the last two months. But the reason, or at least one of the reasons, may be found in what a Kansas dealer has found. He says that, "The excuse given by many farmers for not buying is that the tractors were guaranteed and they should not be expected to pay to keep the machine going. We believe the reason is that field representatives are to blame for overrating the machines and thus leading the farmer to expect too much from them. Some of these same farmers object to paying for quick service by the dealer because they say the field men told them the tractors were guaranted, and they could scarcely be expected to pay for service that a guaranteed machine should give."

This same dealer says he has never known of a single tractor to be a failure where the farmer has had a training in an agricultural college. Where young farmers have purchased tractors, they have been quick to learn the mechanical details, whereas the older men have been very slow to understand them, and, in general, are prejudiced against the tractor.

Still further light is shed on the farmers' attitude toward the tractor by a manufacturer who, after spending a week with his exhibit at the Kansas City tractor show, writes as follows:

"One of the greatest complaints by farmers against tractors was the breaking down of both the engine and the parts. It seemed that many tractors have not been made well enough to stand the wear and tear of farm use, with the result that farmers become discouraged because of this lack of reliability. It would seem that tractor manufacturers should change their tactics with regard to the price of the machine and should aim to furnish the farmer with the best grade machine that can be made, in order to establish in the minds of the farmers the fact that tractors can be made reliable. Just as soon as the farmers understand this, there will be an increased demand which will improve business. Too many tractor manufacturers have been endeavoring to see how cheaply they can build tractors, rather than how well."

400 Visiting Dealers Guests at Show

Little Rock Stages Automotive Event and Boosts Good Roads

LITTLE ROCK, Ark., March 7—The Little Rock Automobile Dealers' Association was organized only a year ago, but this week it is staging a highly successful automotive show with cars, trucks, tractors and airplane engines on display and 400 dealers from over the state as its guests.

Opening day was observed as dealers' day, and the visiting dealers were entertained at the Hotel Marion that night. Among the speakers were George R. Firmin, general manager of the Little Rock Board of Commerce; Joseph A. Schlecht, president of the St. Louis Automobile Manufacturers' and Dealers' Association, and Harry G. Moock, business manager of the National Automobile Dealers' Association. Mr. Firmin spoke on the $30,000,000 road bill now in the Arkansas legislature.

A distinctive feature of the show is the airplane engine exhibit, under the direction of officers and enlisted men from the Aviation General Supply Depot here. The exhibit includes the Liberty, the Hall Scott, Curtiss, Gnome and other engines. An officer explains their construction and operation. This is said to be the first airplane engine exhibit in Arkansas.

Governor Charles H. Brough and members of the Arkansas general assembly were the guests of the dealers last night, the close of good roads day at the show. The attendance at the show, both afternoon and night, was far larger than on the opening day. To-day is ladies' day and to-morrow, the closing day, sales day.

The truck and tractor exhibit occupies a temporary building adjoining Liberty hall, where the show proper is.

DAYTON TRULY AUTOMOTIVE

Dayton, Ohio, March 8—The Dayton Auto Trades Association staged a real automotive exposition in a building especially built for the purpose and affording 86,000 sq. ft. of unobstructed floor space. In addition to 115 cars there were forty-six trucks, two Liberty engines, two baby tanks and the latest DH4 bombing plane. The commercial aspect of avaition was represented by the Blue Bird plane, which represents the first step toward commercialization as the company is planning to manufacture and sell this plane at approximately $1,250.

On opening day staid business men of Dayton were surprised, to say the least, to see a monster bombing plane from McCook field, waltzing over the downtown section of Dayton to music rendered by a forty-piece band heading a parade. The plane dipped low over the buildings and dropped thousands of tickets to the show on the crowd which thronged the streets.

One of the most interesting exhibits of the show was a 7½-ton tank mounted on a Clydesdale 3½-ton truck. The tank was placed on the truck at the plant of the manufacturers, the Platt Iron Works, and hauled for more than three miles.

In addition to manufacturers of trucks and cars, practically every accessory in use was on exhibition. The Dayton Rubber Mfg. Co. arranged its display to show the entire process of manufacture of tires and had an expert on duty at all hours building tires.

Maxwell and Buick had on exhibition their show chassis, electrically operated. The Buick display was so arranged that the operation of the pistons was shown by a tilted mirror.

SHOW INTEREST IN TRACTORS

South Bend, Ind., March 7—Greatest interest in the one-day motor car show held here was in the new farm tractors, which would indicate prosperous business for tractor dealers this year. The show was unusual in that it was held on the principal down-town street in connection with the merchant's spring style show and the crowds were greater than South Bend dealers had ever been able to gather at a previous exhibition.

220 AT USED CAR SHOW

St. Louis, Mo., March 10—The used car show opened to-night in the Exhibit building with twenty-two exhibitors, and 200 cars in place. Each car carried a certificate from the technical committee, testifying as to its good running condition. The show rules bar demonstration cars, and every car shown must have been in private use.

Only a fair crowd attended the opening, but it was a buying crowd. It is estimated than eighty per cent of the cars shown at less than $1,500 were sold. Five cars were sold after being put in place and before the show opened to visitors who gained admission on business errands. Business Manager Robert E. Lee said he never had seen so many visitors at a show where so few were in the aisles. They were all grouped around cars listening to salesmen. The opening of the doors was delayed nearly an hour because at the last moment the city building department demanded that gasoline be removed from all cars before the doors were opened. Previously cars were exhibited containing gasoline. This sent many prospective visitors to the theater for the evening and they are expected to return later.

The demand recently for light cars has been consistently ahead of the supply of used cars and Fords, which were listed new at $360 are selling as high as $400 and 1918 Dodge Brothers cars are selling at $1,000. Some of the large dealers in used cars recently have been conserving the stock of light cars with a view of selling them through the show, and some of the larger exhibitors will hold back some for each day's supply.

BUFFALO SHOW IS BIGGEST

Buffalo, N. Y., March 8—Attendance at the motor car show, which closed to-night, was the greatest in the history of Buffalo shows. The auditorium was thronged throughout the week. John J. Gibson, secretary of the local association, says it is the biggest show ever held in Buffalo. The trucks, which were exhibited around the sides of the auditorium, attracted general interest. Some dealers displayed their cars outside, the Nash agent having a traveling show made up of large parts.

MORE SALES AT 1919 SHOW

Columbus, Ohio, March 10—Dealers handling the thirty-six makes of cars shown at the motor show in Memorial Hall March 5-8 were well pleased with the prospects for business in central Ohio, where truck conditions are good and where farmers are buying more cars. The show was a success in every particular with larger attendance than heretofore and more retail sales.

HOME SHOW IS BETTER

Quincy, Ill., March 7—Home management of both the motor car and truck shows by a local dealer organization with T. R.

Philadelphia Interest Far From Lagging

Philadelphia, Pa., March 8—The eighteenth annual show opened here in the Commercial Museum Building tonight with more space and more models than at any previous show in Philadelphia. It is being held by the Philadelphia Automobile Trade Association.

Public interest is far from lagging and although there are no models not seen at other shows, the people have been so used to a lack of cars the display of $1,000,000 worth of cars at one shot is something of a novelty.

Altogether 200 models are shown by forty-seven car exhibitors, who represent fifty-seven different makes. A good proportion of the cars is fitted with closed bodies, but the proportion does not seem to be as high as in the case with some other shows.

Over thirty exhibitors of accessories occupy the south end of the building and the balcony at the north end. Several of these are jobbers, and the H. C. Roberts Electric Co. is making its debut in the jobbing of accessories. This company has been for years a large manufacturer and distributer of electrical specialties but has just recently entered the automotive equipment field.

Three cars, whose names are well known, but which people know less about than most of the others are here. These are the Stanley steamer, the Revere and the Biddle. The Revere car is a sporting proposition and is fitted with a 105-hp. engine, capable of 80 m.p.h. The body models are brilliantly colored, in chrome green, bright blue, yellow and maroon.

The Biddle has the new type K, fitted with a Duesenberg engine with 4⅝ bore and 6-in. stroke. This model is exactly the same as the type H, with the exception that the type H has a Buda 3¾ by 5⅛ engine. Both of these models are to be continued so.

(*Concluded on page* 27)

Hutchins as president have exceeded the anticipations of the dealers in both attendance and business. Heretofore Quincy shows have been managed by a professional promoter. The dealers' dinner on Thursday, attended by home and visiting dealers, was addressed by Robert E. Lee of St. Louis, who referred to the work of their advertising censor committee, one-price advertising, used car problems and the work the dealers can do in obtaining reasonable and rational street ordinances.

BUSINESS AT HARTFORD SHOW

Hartford, Conn., March 7—Hartford's twelfth annual show was its most successful. It was a good business show. A canvass among the dealers revealed that most of them had done better than in any previous show insofar as actual sales were concerned.

One noticeable feature this season has been the large number of sales before the show. Several concerns report more business in January and February than in any season before a show.

There were eighteen makes of trucks, two makes of tractors and one of trailers. A dinner was held one evening and 200 or more dealers and salesmen attended. The mayor was one of the speakers.

VAN DERVOORT TO EUROPE

East Moline, Ill., March 7—W. H. Van Dervoort has sailed for Europe as a member of the commission ordered by the National Industrial Conference board to visit England, France, Belgium and Italy to study industrial conditions. It is expected he will be some months in Europe.

N. A. C. C. to Hold National Shows

Will Resume New York and Chicago Exhibitions Next Year

NEW YORK, March 8—The old days of motor car publicity, touring and contests will return if the spirit of the car makers at this week's N. A. C. C. meeting crystallizes into action.

All were agreed that the industry had been built by intensive publicity methods, and that the revival of racing, contests and tours would help much in building the industry to greater proportions in the future.

One of the most important steps was a decision that the Chamber should hold the New York and Chicago shows in 1920. The dealers in these cities had held hopes that they might be permitted to duplicate their present year's performances and stage the shows, with the approval and assistance of the factories, but no support for this idea showed strength at this week's meeting, despite the fact that a big percentage of the Chamber's membership had unofficially gone on record as in favor of the dealers' desires.

The statement issued regarding the meeting states however, that "the question of closer co-operation by and with the (New York and Chicago) dealers' associations was discussed" and "the directors probably will act upon this suggestion at their April meeting."

This statement was admitted to mean that the N. A. C. C. would consider giving both associations a larger share in the show profits than they have heretofore received. To date, because the New York and Chicago dealers have held no shows, they have not been financially strong and have therefore not been able to be very active.

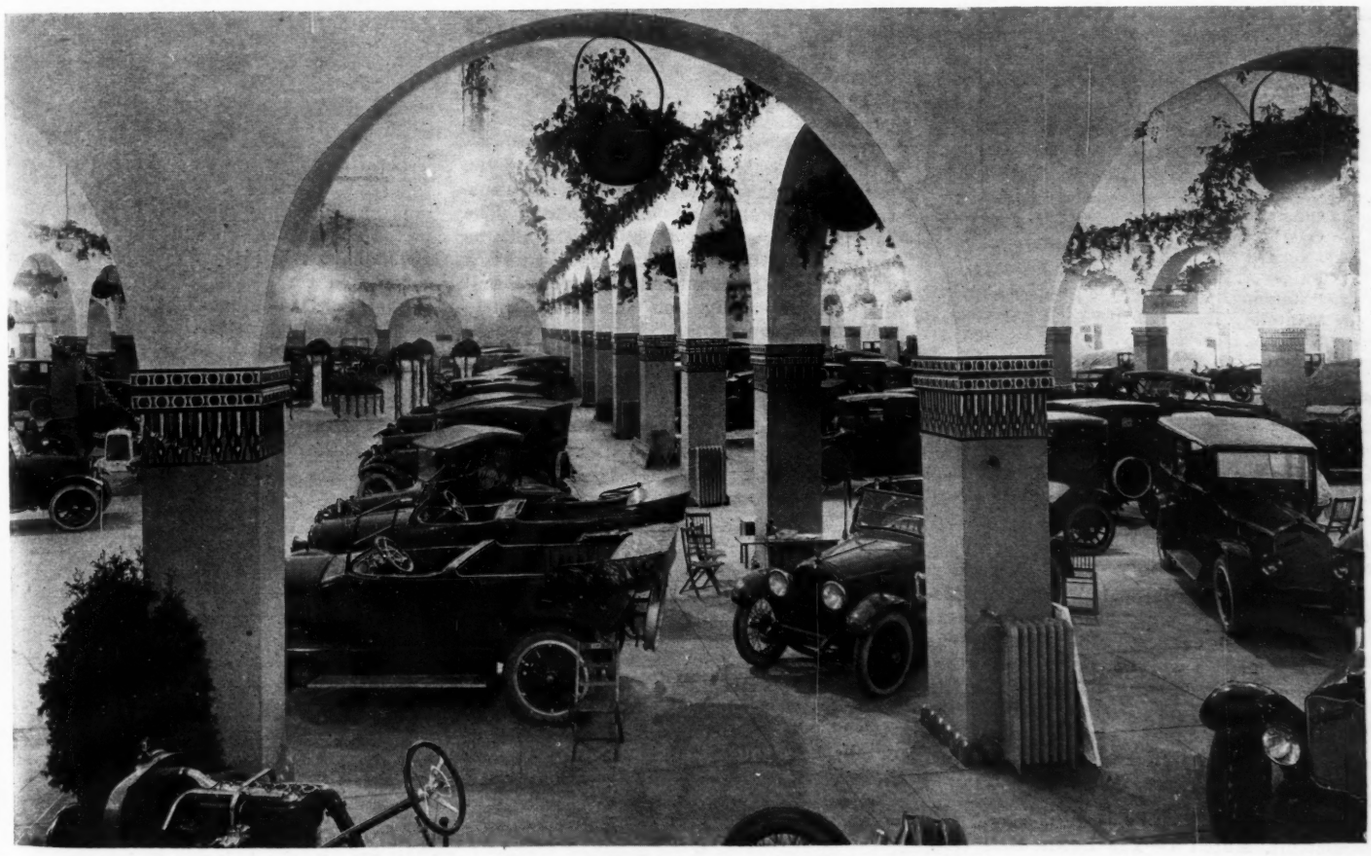
The N. A. C. C. truck members also voted in favor of a truck show, provided it can be held at the same time as the passenger car show.

Trade reports indicate that the factories are fast coming back into production, carload shipments for February being approximately 19,000, whereas in February, 1918, they were 12,030.

INTERNATIONAL SHOW DATES

Paris, March 10—Special cable—At the first meeting of an International Automobile Manufacturers' Congress, held during the progress of the Lyons Fair, a circuit of automotive exhibits was arranged and dates set for the forthcoming French and English shows. The congress, which includes a branch representing America, has set the following dates:

Paris (Grand Palais)	October 15
London (Olympia)	November
Brussels	December
New York	January
Chicago	February



General view of Philadelphia show, which has more space and cars than ever before

February Production Shows Big Gain

How Schedules of Michigan and Ohio Companies Now Run

DETROIT, March 8—Production of cars in Michigan and Ohio during February was double that of the preceding month. This is shown in the production reports from thirty-eight leading manufacturers. These plants produced 4871 cars a day last month as compared with 2833 a day in January.

Nearly every big company is nearing normal production, and the last of March will find them all back at their regular peace-time stride or setting new production records. The labor situation has practically cleared up. The materials situation is improving rapidly. Parts makers are getting back into full production and are now able to meet all demands. Every company with the exception of Packard is now in production. Packard has started work on its new cars, and the first of these will leave the assembly line some time in April.

Production figures for January and February follow:

Car—	January	February
Buick	100	400
Briscoe	30	50
Barley	..	4
Cadillac	55	60
Chalmers	30	65
Chandler	..	50
Chevrolet	..	300
Columbia	8	10
Dodge	300	375
Dort	40	65
Ford	1300	2000
Harroun	4	4
Hudson	30	50
Hupp	38	55
King	0	4
Liberty	15	15
Maxwell	150	150
Monroe	5	5
Oakland	160	160
Olympian	4	5
Oldsmobile	..	110
Overland	320	400
Packard	0	0
Paige	50	50
Paterson	4	10
Winton	5	..
Reo	100	100
Saxon	10	50
Scripps-Booth	20	40
Studebaker	..	150
Essex	30	50
Grant	25	35
Roamer	..	4
Velie	..	45
Total	2833	4871

Nash Production

Kenosha, Wis., March 10—The Nash Motors Corp. has completed its Government contract which called for 1600 Quad trucks and is otherwise winding up its war work. The company is devoting 90 per cent of its attention to regular car production. In February this company produced sixty-five cars daily. In March production will be increased to ninety cars, it is expected.

Hall to Build 1000 Trucks

Detroit, March 7—The Lewis Hall Iron Works, makers of the Hall trucks, is back on a peace basis again after completing 500 machines for the Government. The schedule for the coming year calls for 1000 trucks. This company entered the truck manufacturing field in 1915, producing 100 3½-ton models. The second year it brought out the 2- and 5-ton worm drive model and also the 5- and 7-ton chain drive truck. The first two years most of the trucks were sold along the Atlantic seaboard, but they now are being distributed nationally.

DODGE FOUR-DOOR SEDAN

New York, March 11—Special telegram—Dodge Brothers dealers are expecting deliveries within the next two weeks of a new four-door sedan which will sell for $100 more than the present two-door model, making the price of the new model $1,876. The chassis will be the same as at present.

WALLIS STOCKHOLDER SUES

Racine, Wis., March 10—Suit has been filed in the circuit court by Oliver Conger, Cleveland, Ohio, a stockholder of the Wallis Tractor Co., which seeks to prevent the merger of the Wallis company with the J. I. Case Plow Works and to restrain Case from disposing of any of the assets or property of Wallis. Mr. Conger demands an accounting and injunction. His complaint recites that the Wallis company was organized at Cleveland in 1912 and in 1915 was moved to Racine, where H. M. Wallis, president of the Case company, became president and treasurer.

The claim is set forth that by electing certain directors of the Case company as directors of the Wallis company, Mr. Wallis designed to enrich the plow company at the expense of the tractor company by transferring profits, assets and benefits. The complaint also says that in 1915 it was agreed that the plow works should act as selling agent for the tractor company in all territory extending from the Allegheny to the Rocky mountains; that the plow works was to pay the tractor company $825 for each tractor built, which cost $750. It is claimed each tractor was sold for $1,550, giving the plow works a larger profit. Mr. Conger claims he has been denied access to all the books of the tractor company and charges wrongful administration on the part of certain defendants.

DEALERS HOLD OPENING

Indianapolis, Ind., March 10—Special telegram—The eighteenth annual spring display of the Indianapolis dealers opened to-day and will continue until Saturday. This year it is in the form of an opening week with the displays at the salesrooms. The exhibits, therefore, include cars, trucks, accessories and farm tractors, though the farm tractors are being shown for the most part away from the rows. The Gibson Co. has on display an airplane.

The opening attendance was not as large as expected, but rainy weather interfered somewhat. Larger attendance is certain for the remainder of the week.

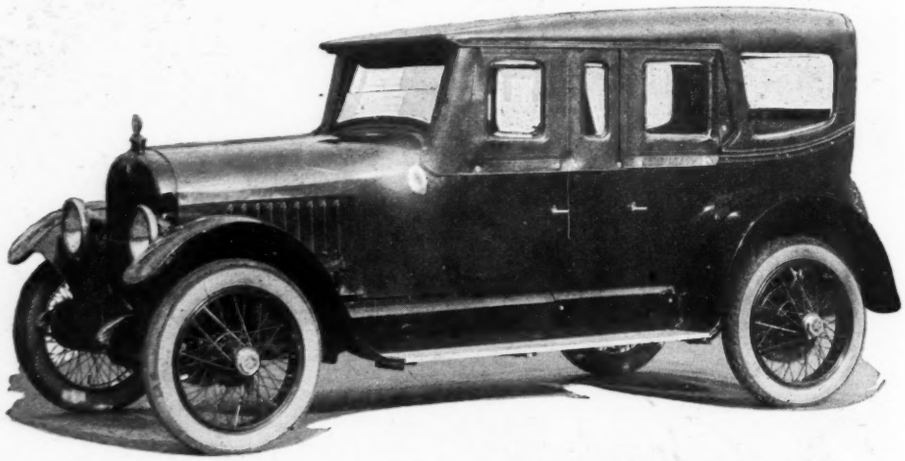
The salesrooms have been decorated, and United States flags reinforced by the flags of the Allied nations, are the main features.

The cars themselves probably are shown in better circumstances than in a show but an opening week has the disadvantage that the prospective purchasers are compelled to go from one showroom to another to make comparisons.

As for prospects, the universal opinion of Indianapolis dealers is that the car will have its biggest year in 1919, that there will not be enough to supply the demand until 1920, that the motor truck is starting on a big career in Indiana and that the farm tractor is only beginning its usefulness.

NEW TRACTOR AT $750

Detroit, March 7—The Detroit-Culto-Tractor Corp., a newly organized concern, is about to place a $750 tractor on the market. The first machine has been completed and production will start on the first 1000 about April 1. The company is incorporated for $1,500,000. H. M. Jerome, formerly chief engineer of Chalmers, is production manager as well as vice-president.



This new top made its first appearance at the Detroit show on the King Foursome. It is made by the Consolidated Top Co. and King will feature it on Foursome and touring models

S. R. DuBrie is chief engineer and secretary. Joseph A. Rowe is president and E. H. Kramer, treasurer.

The new tractor is a one-wheel-drive machine. It is balanced by a side wheel. The engine is V-type 4 by 6, low-compression, heavy-duty type. It is equipped with Bosch magneto, impulse starter, Stromberg carbureter, Pierce governor and air washer. The gear ratio is 30 to 1, having a working speed of 2½ m.p.h. with a drawbar pull of 1200 lb.

A novel feature is the cooling system. The water in the radiating tank is below the cylinders, so as soon as the engine stops all the water drains back into the tank.

WIRE WHEEL SUES BUDD

New York, March 7—Suit has been brought by the Wire Wheel Corp. of America against the Budd Wheel Corp., maker of the Budd wheel. The plaintiff claims infringement of Pugh patent No. 1,030,428 for the process of indenting and perforating the rims; of Duffy patent No. 1,125,498 for an automatic locking hub construction; of Pugh patent No. 903,608 for a protected lock; and House patent No. 1,166,130 for a radially swinging lock.

The Wire Wheel Corp. of America has granted licenses to the Standard Roller Bearing Co., Philadelphia, which employs only the Pugh patent No. 1,030,428; to the Hayes Wheel Co., Jackson, Mich., and the Dayton Wire Wheel Co., Dayton, Ohio, which use all four patents. The suit has been opened in the Eastern District of Virginia.

HOUSES FOR SAMSON WORKERS

Janesville, Wis., March 8—A check for $100,000 has been given by President W. C. Durant of General Motors for the building of homes to house workers in the Samson tractor manufacturing plant. The building of the houses will be carried on by the Janesville Housing Corp., recently organized by local business men for $300,000. The $200,000 remaining was subscribed by Janesville interests.

STEPHENS DISTRIBUTERS MEET

Freeport, Ill., March 8—The annual meeting of the distributers of the Stephens car will be held here March 17-19. Talks by car experts, an inspection of the plant, a banquet and other entertainment are planned. Approximately $125,000 is being spent now on additional buildings and equipment. The schedule this year calls for 5000 cars.

FEDERAL MOTORS FINANCE

Detroit, March 7—The Federal Motors Finance Corp. is being organized in Detroit with a capital of $5,000,000. The corporation will give credit to purchasers of cars, trucks and tractors. Detroit bankers, attorneys and automotive men are behind the movement.

HEINZE IS $2,000

Bay City, Mich., March 7—The retail price of $2,000 has been fixed on the Heinze four-wheel-drive tractor by its manufacturer, the Traction Engine Co. of this city.

Plane That Lands Itself Is Foreseen

Commercial Future of Aviation to Bring Ease of Landing

NEW YORK, March 8—That it is not only quite feasible to produce an airplane that will be inherently stable and virtually fly itself until its fuel is exhausted but one that will even land itself was one of the surprising statements made last night at the aeronautical meeting of the Society of Automotive Engineers, held in conjunction with the aeronautical show. About 450 members and guests attended the two sessions and heard papers by officers prominent in the Army and Navy air services.

The statement with regard to a self-landing plane was made by C. H. Day, chief engineer of the Standard Aircraft Corp., Elizabeth, N. J. After reviewing the history of heavier-than-air machines and crediting the first experiments to a Taranto philosopher by the name of Archytas who lived about 400 B. C., Mr. Day launched into "The Commercial Future of Airplanes from the Engineer's Standpoint."

"A great deal of attention has been given to devices to increase the stability of the airplane, with an idea that this will greatly increase its safety," he said. "I do not believe the development of such devices will greatly enhance the future of the airplane. The ease with which pilots have learned to fly existing training machines would certainly indicate that the stability of these airplanes is sufficient for present needs, and investigation will show that the majority of accidents have been due either to collisions in the air or bad landings and not through any inability of the pilot to control the actions of the machine.

"By fixing the rudder on such a machine, it will fly almost indefinitely with all controls released and, in case of motor stoppage, will assume a natural gliding angle and maintain that gliding angle until it reaches the ground. With good air conditions, it would even make a safe landing if the ground were suitable. While riding as a passenger in such a machine three years ago, I personally saw all these things demonstrated in flight.

"To my mind the most important development for the future will be that which will enable airplanes to land in extremely small fields, or literally, in a man's backyard. And this must be obtained at not too great a sacrifice of high speed. At the present time the load carried on an airplane which has sufficient reserve power for safe flying is about 20 lb. per horsepower, and a speed range of from 45 to 90 m.p.h. is now obtainable with this loading. It would seem therefore that the future airplane should maintain a speed of 90 m.p.h., speed being one of the main advantages of the ariplane over other means of travel.

"As to the size of the future commercial airplane, it is my opinion that the machines most used will be those carrying from one to twelve passengers or corresponding loads of mail or express. But for certain purposes we may expect to see airplanes of a size far beyond our present dreams."

Ladislas d'Orcy, in presenting "The Case for the Airship," offered as his opinion that "airships should mainly be employed in transcontinental and transoceanic traffic, while airplanes could be used for feeding the airship terminals with passengers. In this way the airship would compete with the steamship and the airplane with the railroad train; the saving of time in either case would amount to at least 50 per cent."

EUROPE'S POST-WAR CARS

Chicago, March 7—Passenger cars are beginning to be built in Europe for the general market, but real post-war models will not appear for many months, is a message brought back by David Beecroft, directing editor of the Class Journal Co., who recently returned from a three-months tour of the automotive factories of France, England and Italy. Mr. Beecroft, in an address to the Midwest section of the Society of Automotive Engineers to-night, said that significant developments in the after-the-war designs are commencing to appear. He said:

"Renault, for example, is turning out a car to sell at approximately $1,000, which would seem to mean that some of the builders are going to invade the low-priced field in earnest. In general, though, there is little disposition among European manufacturers to sacrifice the traditional quality of their production for the quantity schedules that characterize much of the American output.

"European engineers tell me that they have learned more from one Grand Prix road race in France than from airplane operation during the whole four years of the war. The conditions under which aviation engines operate—at high altitudes and in extreme cold—are so different from those which apply to the motor car engine that there is little basis of comparison."

$1,500,000 SHOW BUSINESS

Detroit, March 10—Detroit's greatest show has just closed. Dealers are unanimous in declaring the event the most successful in the history of the association. It was the most successful for many reasons, chief of which are as follows:

It produced total business aggregating $1,500,000—the greatest sales record for any show ever held in this city.

It was the greatest exhibit from the standpoint of space, it being the first show in which all exhibitors were on one floor.

Buying was not limited to any one class of cars. It seemed to be general, for the people bought everything from the $500 to the $6,500 vehicle.

Truck and tractor business was equally as good. Such interest was manifested in the commercial car department the association will stage a truck and tractor exhibit as a separate event next year. It will be the first to be held here.

A Satisfied Customer Spreads Bill's Gospel of Cash

"YOU know," said Henry Barnard, "I'm becoming more stuck on the advantages of paying cash every day."

"It's the only system," agreed Jim Davis, warmly, between puffs. The two men were comfortably seated in the deep, leather chairs in Bill Strong's customers' lounging room. It was a sort of informal clubroom where owners met to chat about the topics of the day and, more likely than not, to talk about some feature of Bill's garage business, for Bill was always starting something worth talking about—no wonder his business was successful—one of the best in Liveburg.

Bill a Bright Spot

Henry Barnard was comparatively a newcomer, just beginning to appreciate Bill and his methods, while Jim Davis was an old-timer, a half-retired business man who made motor cars a hobby and centered on Bill's business as one of the bright points in his hobby. To him it was a continuous romance.

"At first I was a little resentful regarding Bill's strictly cash rule, but Bill soon convinced me that its advantages were mostly on my side," confessed Barnard.

"Yes, it's the modern way to do business," replied Davis, in whom the discussion struck a bright spark of enthusiasm. "I'd hate to have to store my car in a garage that did business on tick."

"Credit and backwardness go hand in hand as do cash and progress. The one is a symbol of the other. Look through your commercial geography, and you can tell how civilized a country is by how close it comes to paying cash. Slap your money down and end the transaction then and there for all time. That's the dashing method of modern business. No slips to sign, no memorandums to keep, no arguments, no misunderstandings, but simply an end to the transaction the moment it was begun. Of course it's hard on the fellow who wants to live beyond his income and ruinous to the crook, but so much the better.

"Don't misunderstand me. Compared with other less progressive nations the U. S. comes close to the cash principle but not close enough. Here a month's or two months' credit is given, while in South America, for example, several months is nearer the rule. It is typical and part of the second-speed methods of these countries. The old U. S. is running in third gear, but she ought to get into fourth. Wait till she gets rid of this credit foolishness and watch her hum!"

Jim paused. Barnard didn't quite agree and started to object at Jim's extreme radicalism on the subject. Just then Bob Hubbel, a young garageman from the next town, opened the door.

"Seen Bill," he asked.

"He went out for a few minutes," replied Davis. Bob Hubbel, scenting an interesting and illuminating conversation, sat down to wait. Every time he got the chance he stopped in to have a chat with Bill, and the latter, believing in the broad-minded idea that anything he could do to elevate the plane of the business also would make him grow and prosper, always welcomed Bob with open arms. Bob Hubbel was only one of several close friends Bill had in neighboring towns in the garage business, not to mention those in Liveburg. The intimacy seemed to help rather than impede their progress individually. Everyone gained and not one lost by this close co-operation. Bill was the leading spirit. It was just one phase of his uncanny farsightedness.

Jim noted Barnard's attempt to question and veered his discussion intuitively to answer, "There are some places where the buy-now, settle-any-time-after-this-month principle is defensible, even preferable, but very few. But let's get back to the main thread of the argument."

Bob Hubbel was fascinated. He believed in the cash idea but was afraid of how the owners would take it. Bill Strong had adopted it many months before and it had been a success from the start, but then Bill was a genius; he could do anything. He had always doubted whether he could get his own customers to stand for it. So what these two faithful adherents to Bill's business methods had to say was doubly worth listening to.

Davis continued: "Almost any sane man would rather do business on a cash basis if the merchants, garage merchants included, would only stop to explain the advantages instead of doing their best to coax him to live two months ahead of his income by offering him credit and then grumbling because they have trouble with the system.

The Credit Bogie

"I'm going to turn cynic for a moment and roundly ridicule the idea. The credit bogie preaches, 'Buy on credit. Put off the moment of settlement. The longer the lapse of time between purchase and payment the more trouble it makes, trouble in keeping records by buyer and seller and trouble due to disputes and misunderstandings. I am the god of inefficiency. I advocate retrogression not progress. I am a business bolsheviki. I promote misunderstandings and foster squabbles with customers and thus build up ill-feeling that tends to wreck businesses. For this work I use a single, subtle weapon. It looks like a tool of efficiency but nearly all who use it are fooled. I know because I invented it. It is 'Buy on credit.'"

Barnard was so flabbergasted at Jim's flight of imagination he was tempted to ask him where he had read it, and Hubbel was so hypnotized by its interest that he looked like a wooden image, but with ears wide open.

Davis continued: "But all is not well in the domain of the bogie. A sleek and shining rival has appeared and is slowly ousting his shaggy, black, twisted carcass from its strongholds. He is a demon of efficiency and his weapon is 'Pay Cash.' He proclaims, 'Do it now and finish it. Buy now

and pay now and be done with it. Why prolong a transaction a month if you can complete it now? I am the representative of straight-line methods. I take the shortest distance between two points. There are no curves or breaks in my movements. I am a straight line. I am the enemy of lost motion and stand for efficiency and progress!''

''Let us compare the two systems briefly,'' continued Davis, prompted by a request from Bob Hubbel as to specific reasons why he, as an owner, preferred to pay cash.

Trouble with Credit

''If I buy on credit, a sales slip is made out and I am asked to sign it—if the garageman is systematic—to prove later I really made the purchases. But while the clerk is doing this I have plenty of opportunity to pull out my roll and hand over the cash. It requires no extra time or effort beyond waiting for the change, and that should, must, only be an instant. The man must be almost instantaneous in making change. Slow change-making is one of the principal reasons for charging things; this applies especially to department stores. It's all a matter of habit. We don't mind buying newspapers or streetcar tickets on a cash basis, and it should take no longer to pay for a tire or 25 gal. of gasoline, provided change-making is rapid, and surely that is a simple enough detail. The money must be handy and it must not be necessary to run all over the neighborhood to break every $10 bill. Even if there is no sales slip to be made out, the delay in paying cash is not appreciable. I can be getting my money out while the articles are being offered or wrapped up, and it should only take an instant for me to receive my change. This applies to buying gasoline at the pump as well as articles in the accessory store.

Pays by Check

''Personally, I pay all items over $1, whether it is gasoline, shoes or what not, by check. Every good business man knows it is the only way to keep a record of expenditures. While I am making my purchases, I get my checkbook out and fill in everything but the amount, then as soon as I am through ordering and know the total I write in the amount, tear the check out and then I am through with that particular transaction forever. Simple, isn't it?

''Look at the trouble I run into when I charge it. When I receive my monthly statement I go over it, but there are so many items on it I cannot remember whether they are right or not, and I pay it wondering whether the garageman is honest and if so is he accurate. Or if there is an item that I question, I must carry the darn thing around with me until I have time to ask him about it, and just when I have the time he is out. We argue about it. Perhaps he is right, and perhaps I am. Maybe we agree, and maybe we don't. If we don't, I may take my trade elsewhere, only to experience the same luck. To look up a new garage is a trouble and a bother. Whether I shift my patronage or not, I may become a knocker and thus scare away trade. This, of course, is bad for the garageman and is contrary to all theories of business, for as a satisfied customer I should be a rich asset.

''I may receive carbons of the sales slips with my statement, and they may even be signed by me, but ten to one the writing is so bad and blurred I cannot read it satisfactorily. Besides it's a nuisance to have to go through the ceremony of comparing these slips with the statement; I'd rather pay cash and duck all this trouble.

''Suppose a man hasn't got the cash,'' suggested Bob Hubbel.

''If he hasn't the money, he had better lay up his car until he has. Credit is simply allowing him to live beyond his income, and that is not right.

''Nearly everyone concedes that running a repair business on credit is shaving close to disaster, and many have been forced to put this department on a strictly cash basis even though they did not have the nerve to apply it to all departments.

''Supposing I have my car overhauled and then have to wait a month for the statement. I go over it and find that there are several things to question. One item looks far too large and I cannot remember ordering another, which is, however, down there in black and white. I go to the garageman and protest. I know very well I should not have done this at the time I received my car from the shop, but the garageman did not suggest it because he wasn't working on that up-to-date plan and I let the matter slide. There is plenty of cause for argument over the average repair bill, even when the owner goes over it on the spot, but when the transaction is a month old, perhaps more, if I am too busy to see about it at once, the case is well-night hopeless. We both waste a lot of time trying to remember details. More time is spent looking up records which usually are not complete enough to be convincing, and a lot more time is spent in argument. Usually the upshot is he pockets a loss or I take my trade elsewhere. I have wasted a lot of time over the incident and so has he, not to mention the fact that I have become disgruntled and am now a serious liability instead of a shining asset.

''As for the man whose car is usually in the hands of members of his family or his chauffeur, the solution is not difficult. Bill Strong has solved this problem very nicely by issuing coupon books of various denominations. These are sold for cash, and when any member of his menage has a purchase to make at this garage, coupons to the amount of the purchase are torn out. This eliminates the bother of doling out money at unexpected moments and is especially desirable where there is a chauffeur, for it eliminates the necessity of his handling cash. All those who have tried it are strong for it.

Coupon Book in Car

''Where several members of the family drive the car the book may be kept in the car, so that if the daughter starts downtown without enough change in her pocketbook and finds she needs gasoline, it is there ready for her. Theft of the book is futile, for the serial number of the book appears on every coupon, and the name of its purchaser and the serial number are noted when the book is sold so in case it is lost or stolen the owner simply reports the fact and the first individual who tries to use its coupons is quickly recognized, even assuming the fact he was not a book purchaser was not realized the instant he presented it.''

''Bravo, Jim,'' greeted Bill Strong, who just burst into the room in time to hear the tail end of this peroration.

''Hello, Bob, how are you? Glad to see you again,'' said Bill, cordially.

''Mr. Davis has been extolling the advantages of the cash business,'' explained Hubbel. ''I never realized that most of the advantages were on the owner's side. You used to say so, but it took an owner to convince me.''

Saves Garageman

''That's true,'' said Bill, ''but don't forget it also saves a pile of clerical work for the garageman, eliminates bad debts, and, what is most important, stamps him undeniably as progressive, up-to-date, on his toes. It puts a new face on his whole business, pulling him out of the shade into the spotlight.''

''Where are you going?''

''Guess I'd better hurry home and start to get rid of my credit worries. I'm sold on the idea.''

CREDIT BUREAU FOR TIRES

Milwaukee, Wis., March 7—The Milwaukee Tire Dealers' Association, embracing a large percentage of the 225 tire dealers and repairshops in Milwaukee, has established a credit bureau to protect members against bad accounts. All members have furnished credit information regarding their customers, which have been compiled and is now available for reference. In the past the absence of such information has enabled certain car owners to run up unduly heavy accounts with several dealers, each of whom suffered losses.

Members of the association also feel improvement in their business methods effected by necessary wartime economies has been too beneficial to allow them to revert to pre-war extravagances, such as super-service, 24-hr. working schedules and other wasteful practices. In the main, dealers and service stations will continue to close at 6 p. m. and Sundays. Free air will be dispensed, but when attaches of the station are asked to give car owners service in gaging and filling tires, a charge charge of 5 cents a tire will be made. If of 5 cents a tire will be made. If owners do this work, no charge will be made.

TRAILER MAKERS REORGANIZE

Cincinnati, Ohio, March 7—The Trailer Manufacturers' Association of America met here recently and effected a reorganization. Co-operation with the truck makers was considered, and it was decided to protect the interests of the truck industry in every way, with the idea that there should be no suggestion in the merchandising of the trailer that it takes the place of trucks or makes trucks unnecessary but rather that by reducing hauling costs it makes profitable the use of trucks under conditions otherwise unfavorable.

W. E. Ferris of the Ohio Trailer Co. heads the organization. The other officers are: Vice-president, W. A. Murfey of the King Trailer Co. and R. C. Sykes of the Troy Wagon Works Co.; secretary-treasurer, J. C. Endebrock of the Trailmobile Co.

Garage Planning
Service Station Arrangements

Plan No. 21

IN answer to the inquiry of the Park River Motor Co., Park River, N. D., which wants a suggested arrangement for a garage with workbench across the rear end of the building, plan No. 21 is offered by MOTOR AGE. This garage is to be 50 ft. wide and 120 ft. long.

If the workbench is 20 ft. long, it would be enough, but 22 or 23 ft. would be better, as a large car is 15 ft. long, and that would leave only 5 ft., or 2 ft. 6 in. at each end.

To rid the shop of fumes from the charging batteries, inclose the charging benches in a small room with an ample ventilating pipe through to the roof. This will work much better than a hood, as the door will supply fresh air, while a hood is very uncertain. Every current or draft of air will interrupt its functions. A hood also would not carry off the chlorine gas, which is heavier than air.

The accompanying illustration shows the machines, such as lathe, one large and one small drill, gear and slot cutting machines, electrical plant, etc., placed along one end of the repairshop and supplied with power from a line shaft overhead, which derives its power from the motor-generator or gas engine generator used for battery charging.

The roof of the building should be supported by trusses to leave the floor free from posts. The walls of the office and shop should extend to the roof or some sort of ceiling so they can be heated to a higher temperature than the rest of the garage.

Plan No. 22

INCLOSED is a sketch of a concrete-constructed garage. Will you turn it over to your engineering department and have it give its opinion on the practicability of the design?

MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and inquirers are urged in asking for such plans to be sure to include the following information:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repairshop.

And how much of an accessory department is anticipated.

This building is to be 50 by 135, double concrete walls and roof, that is, each wall 4 in. thick and a 4-in. wall space, making 1 ft. in all. Four feet of the outside member of the wall rises 4 ft. for trimming effect. The building sets on walls 2 by 3 ft. Two by two-foot blocks support pillars E. These are spaced down the length of the storage space 8 ft. apart and are set out 14 ft. from the walls. These spaces are for the emplacement of cars. Steel bars drop into grooves in the pillars and can be locked in place, the owner having the key, thereby preventing any joyriding in his car and also protecting it from awkward drivers turning in the garage. Eight feet gives the owner sufficient room to do his tire work without moving his car into the main driveway.

The reason of the double wall and roof is to make the building frostproof in winter by reason of the dead air space between the walls. The walls and roof are separated entirely, except at the junctions C and F, so there will not be much chance for the frost to creep through to the inner wall.

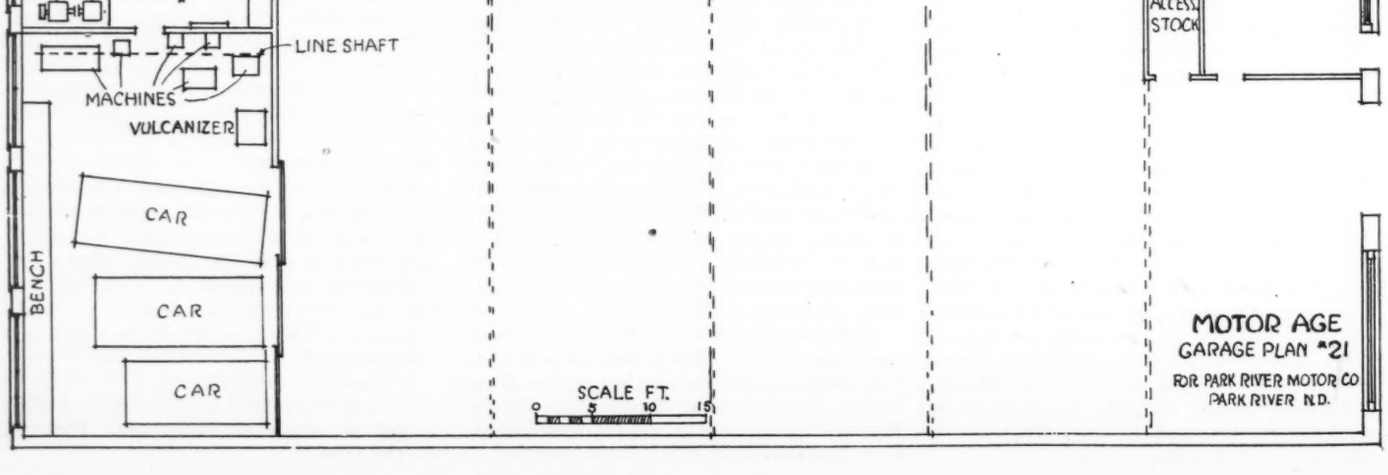
In the summer here it gets to be 110 in the shade. On such days the heat tires a workman more than the actual work itself. By keeping the outside wall and roof fairly moist, evaporation should keep the building cool on the hottest days. Do you think it will make the building any cooler to have the ventilators B closed at the bottom, thereby creating a draft through the openings A, through the outside walls and then up through openings in the junctions C, or would it be better to leave the spaces dead and use the ventilators for the inside of the building only?

The roof is tied by the steel rods D every 8 ft. the entire length. Is 4-ft. too thick for the roof? What should be the nature of the reinforcing? Could I build a flat roof and use the same cooling features as this? Would it be cheaper?—Clifford Machine Works, Brewster, Wash.

Separate Locks for Owners

The idea of having a separate space in which each owner's car may be locked is very good, but we do not advise the construction of your building as you suggest, so let us dispose of this matter first.

Of course the triple-arched roof you plan would be much more expensive, but this would not be objectionable if there were commensurate advantages. But a plain flat roof will give just as cool an interior, perhaps cooler, if there is a good space between the ceiling and the roof. Also this



roof renders the expense of posts unnecessary.

Hollow tile affords better heat and cold insulation than the double wall construction you have in mind. The large space in your wall allows a certain air circulation, and this will increase the flow of heat through the walls. But the very small air spaces in the hollow tile gives insulation hard to excel because the air spaces are so small there is little chance for the air to circulate. Under these circumstances air is an almost perfect insulator. Air can carry heat but is practically a non-conductor.

A cross-section of the building suggested is shown. The side walls are made of hollow tile coated on the outside with pebble dash or some other suitable coating and plastered on the inside.

The roof is carried on a series of cross-wise trusses which rest on brick piers. There is a ceiling so that the air space in the truss is confined, thus providing good heat insulation. This ceiling may be of any easily-attached fireproof material such as asbestos board. Lengthwise wood strips are tacked to the cross-wise truss members and the board is fastened to this.

Tar and gravel is a suitable material for a roof covering although others may be used. Lengthwise strips are nailed to the top of the truss members. Five-eighths or ¾-in. sheathing is attached to them, and the tar paper is laid on top of that.

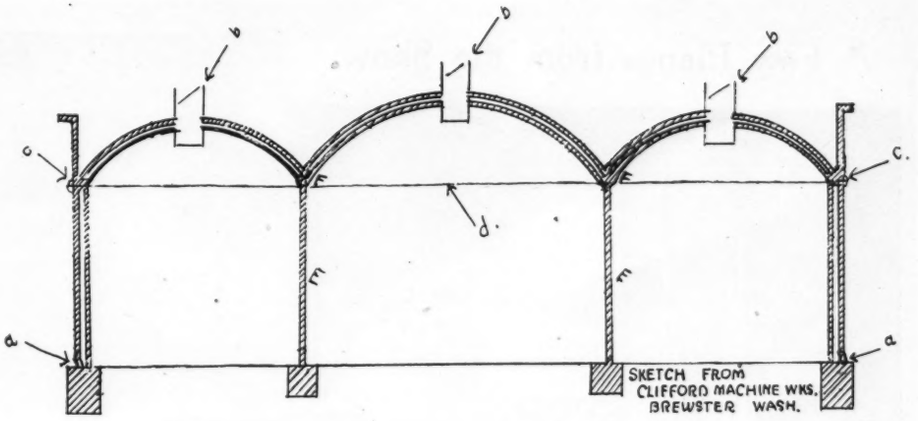
Cheaper and More Comfortable

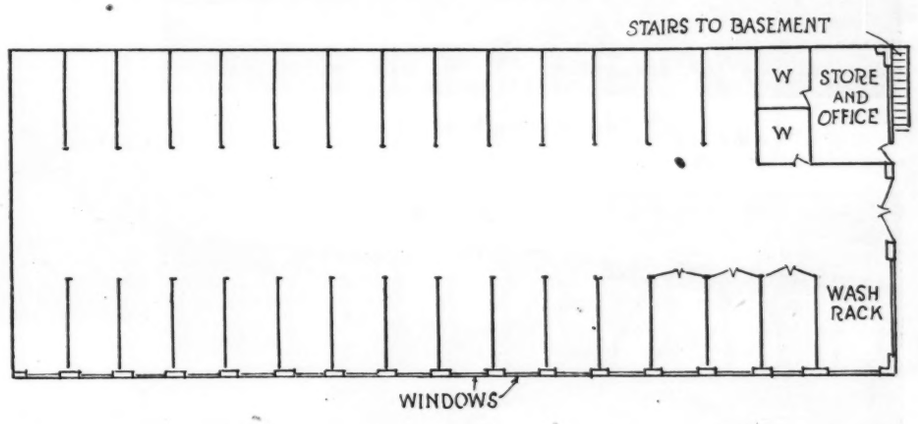
On the whole this building will be warmer in winter and cooler in summer than the one you have in mind. At the same time it will be much cheaper to build.

The Howe truss is one of several types of roof trusses which may be used. Any good builder understands this work and therefore, it is not deemed necessary to give further details here.

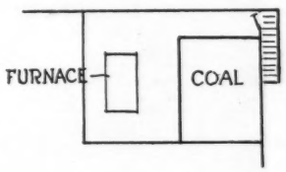
We should advise you to have plenty of windows, say one large window in each car space, as shown by the plan. Copious use of windows will provide plenty of ventilation in summer, and although a building full of windows will require more coal, as much daylight as possible is almost a necessity. Garage space in a light building is always more salable and commands a higher price. A dark interior naturally is repelling, and in addition any owner who stops to consider the matter will prefer a light garage as he can do his repairs more quickly and do them better.

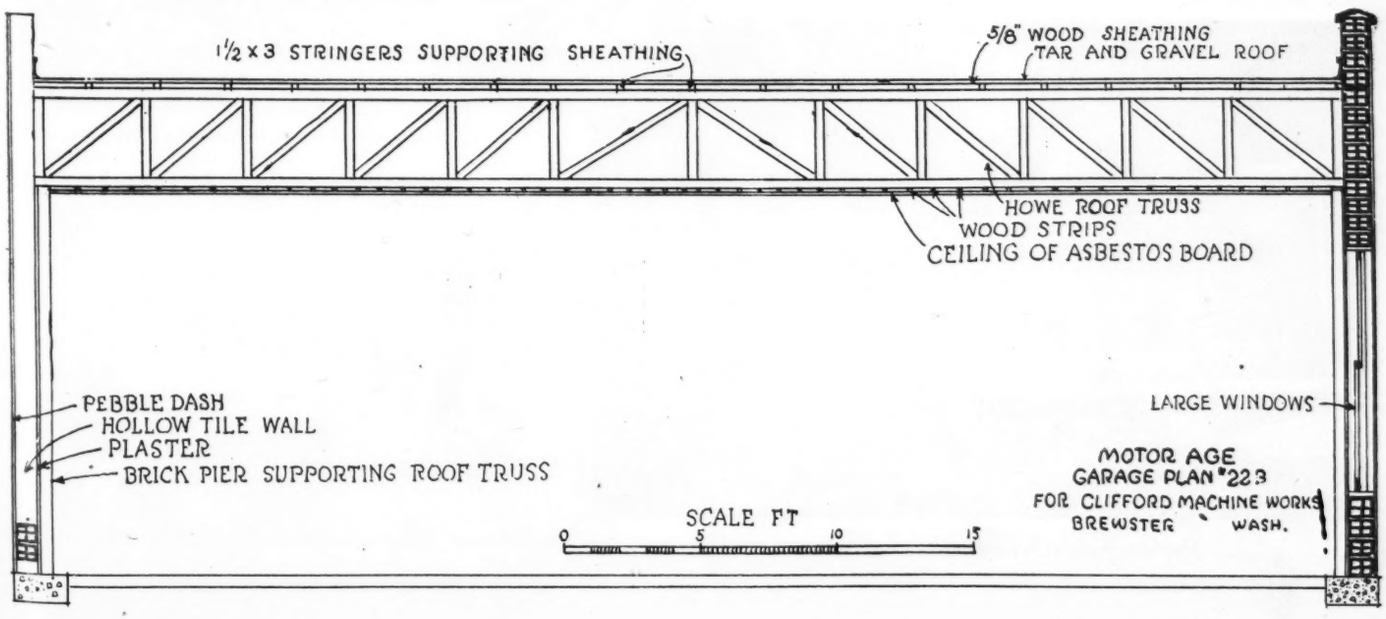
Instead of solid partitions between the car spaces we advise the use of a heavy wire grating with doors of the same material at the front, for it is cheaper and just as satisfactory, and improves ventilation and distribution of light. This is the material that has been used generally in the few garages of this type constructed.





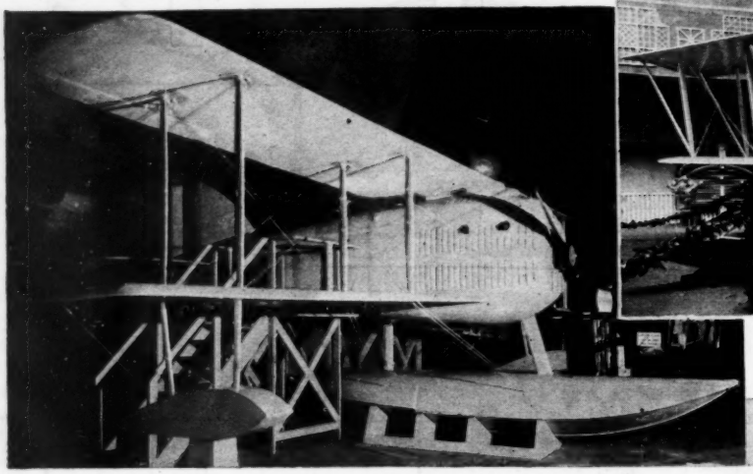
MOTOR AGE
GARAGE PLAN #22A
FOR CLIFFORD MACHINE WORKS
BREWSTER WASH.



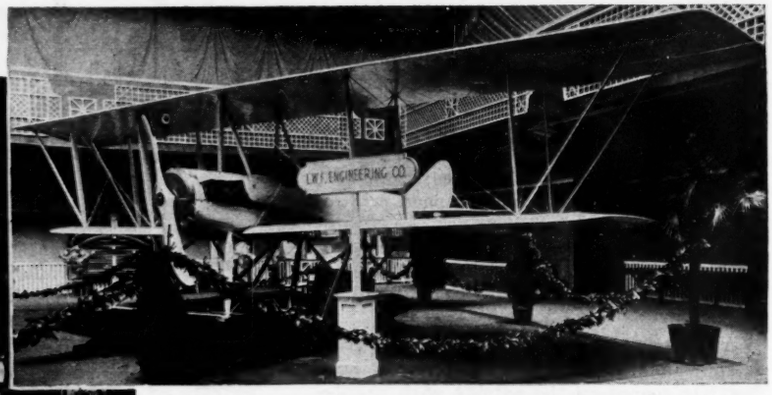


MOTOR AGE
GARAGE PLAN #22B
FOR CLIFFORD MACHINE WORKS
BREWSTER WASH.

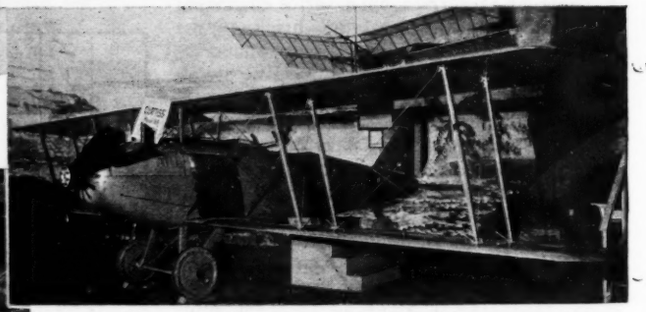
A Few Planes from the Show



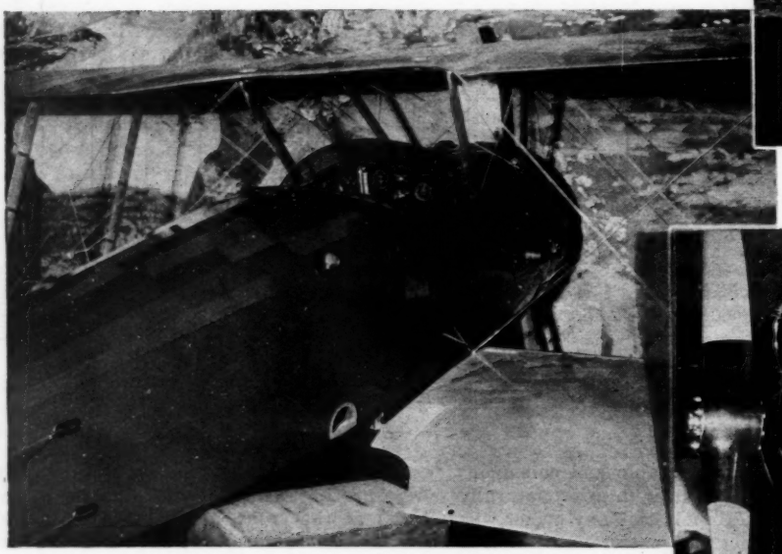
Curtiss flying boat



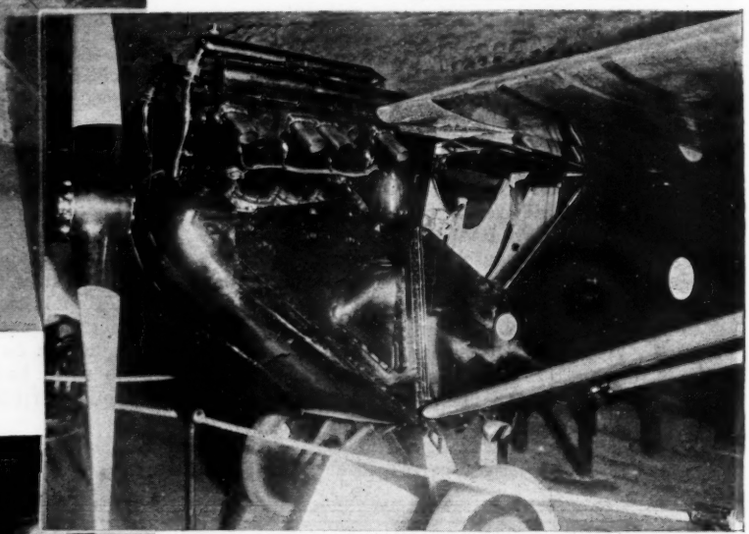
L. W. F. sporting hydroplane



Curtiss plane that makes 175 m. p. h.

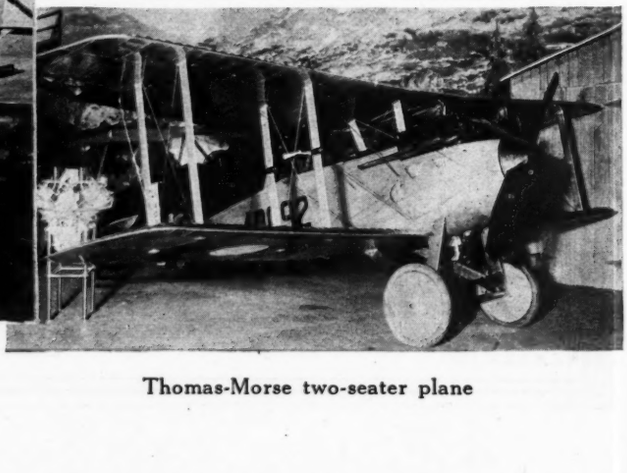


Thomas-Morse high-speed plane

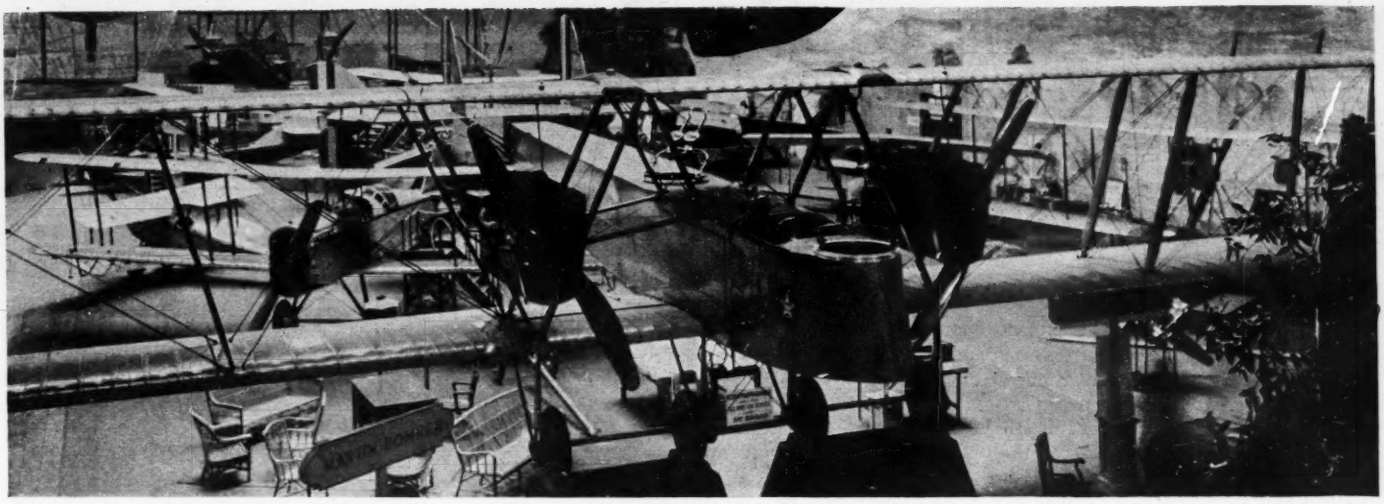


Closeup of Loening monoplane fighter

Dayton-Wright honeymoon express



Thomas-Morse two-seater plane



Martin twin-engined bomber at the aeronautical show in New York

Sport Models First at Air Show

Already Salesmen Have Selling Points for Commercial Models

NEW YORK, March 7—The real extent of the public interest in aviation is demonstrated by the size and enthusiasm of the crowds which are attending the show now on in Madison Square Garden and the 69th Regiment armory. The keynote of the exhibition as an index of the present and future status of the industry is the under current of practical business which pervades what is of necessity a show principally of warcraft.

When one considers how recently and suddenly the war ended, the uncertainty and disorganization that inevitably followed, the short time since the signing of the armistice, it is surprising that the plans of the manufacturers to sell airplanes like passenger cars have been carried so far. Several so-called sport models finished with all the attractiveness of show cars are exhibited—practical machines, with an average selling price around $12,000 to $15,000, that will certainly appeal to the numerous sportsmen of the country.

Selling Points of Planes

Already the salesmen have discovered selling points, individual excellences that mark their particular machines. The features that will differentiate civil craft from military have not had time to develop, but there is ample evidence that the industry is hard at work on these problems. That more of these features are not evident is due solely to the fact that there has not been time to develop them. Most of the makers of military craft are anxious to continue production of proven models with only those changes that are necessary to turn them into everyday airplanes for civil use, mail and parcel carrying and sporting types.

Several exhibitors are showing new models designed principally for private owners. The Thomas-Morse Aircraft Corp. has brought out the S-6 tandem built for sportsmen with a low-landing speed of 38 m.p.h. and a maximum of 105 m.p.h. Another model, the S-7, has a side-by-side seating arrangement with a landing speed of 35 m.p.h. and a maximum of 90 m.p.h. Both models use 80-hp. LeRhone engines.

The Curtiss Aeroplane & Motor Corp. is exhibiting an attractive flying boat with side-by-side wicker seats. The machine has a Spanish cedar hull and is veneered throughout. This model has a cruising radius of 325 miles, using the OX eight-cylinder 100-hp. engine with a bore of 4¼ in. and a stroke of 5¼. The upper wing has a span of 49 ft. 9 in. and the lower 38 ft. 7 in. There is a dihedral of 1 deg. on the lower wing. The landing speed is 45 m.p.h. and the maximum is 70 m.p.h.

The Dayton-Wright Airplane Co. has brought two models of interest commercially, the Honeymoon Express and the Messenger. The first, the D-4K model, carries three passengers and has a canopy-covered compartment with an upholstered body and seats, built-in mahogany vanity and lunch boxes and a plate mirror. Its cost ranges from $15,000 to $20,000. A 400-hp. Liberty twelve is used. Both wings have a dihedral of 3 deg. The single-seater Messenger, weighing only 475 lb. and costing $2,500, is a feature of the Dayton-Wright exhibit. The machine has a wing spread of 19 ft. 3 in. The de Palma 37-hp. air-cooled, four-cylinder engine is used. The landing speed is 37 m.p.h. and the maximum is 85 m.p.h. This company also is exhibiting a working model of its three-passenger sedan. This model is covered with enamel throughout and has a completely inclosed body with four windows, electric lights, upholstered swivel chairs, a card or dining table and rugs on the floor.

The Aeromarine Plane & Motor Co. has brought out a three-passenger seaplane, model 50, with a combination celluloid top for two passengers. The pilot pit is open. The passengers' seats are of wicker and arranged side-by-side. A 4¼ by 6½, six-cylinder all-aluminum engine is used. This develops 130 hp. and is equipped with a Bijur generator and Delco ignition.

The Wright-Martin Aircraft Corp. is exhibiting the Loenning two-seated monoplane, equipped with a 300-hp. Hispano-Suiza engine.

A feature of the Loenning is the low-center line of the powerplant, which sends the bulk of the air stream under the wing. The pilot is in such a position that his eye is on the level of the plane, giving him a range of view both above and below the wing. No supporting wires are used above the wings, these being braced to the chassis by two streamline steel struts underneath. The control wires are all inclosed in the wings, leaving clean, unobstructed surfaces. The machine shown is equipped for military use with four guns, two of them operated by the pilot. At the time of the armistice this plane was in production for the Government. It has a span of 32 ft. with a 7-ft. chord and makes 145 m.p.h.

How Gallaudet Differs

A development of the small machine with radical departure from standard airplane practice is shown in the monoplane brought out by the Gallaudet Aircraft Corp. Two propellers, one on each side of the fuselage, are driven by two Indian engines by a disk clutch working on a jackshaft with bevel gears at either end. Both propellers are driven by either one or both of the engines. If one of the engines breaks down during flight, the other one can be used on both propellers to land the machine safely. The engines develop 21.85 hp., giving a take-off of 45 m.p.h. and a maximum speed of 90 m.p.h. The wing spread is 33 ft. The machine weighs 1061 lb. with two men. There is no wheel rigging, the wheels being partly concealed on account of being built right into the fuselage. This cuts down wind

(Concluded on page 29)

Essentials to Good Salesmanship

This Sales Promotion Man Thinks That with an Attractive Place of Business and Personality Half the Battle of Selling Is Won

By Fred M. Loomis
Motor Age Editorial Staff

AN attractive place in which to do business and personality in salesmanship are two primarily essential requirements which must be met if the motor car dealer hopes to be successful, according to D. L. Agnew, sales promotion man for the Twin City Motor Car Co., distributer of the Hudson and Essex cars in Minneapolis.

Mr. Agnew places the greater emphasis upon the salesroom and its adjuncts. It is not necessary that the salesroom shall be either expensive or pretentious, but it must be clean and attractive. Five dollars' worth of paint and a strong right arm can accomplish wonders when they are employed properly together. A simple decorative scheme helps a lot, too. A rug and a plant or two, placed where they can be seen from the outside through spotless windows, add to the inviting aspect of the salesroom and help mightly in backgrounding a display of cars. Too much attention cannot be given to cleanliness about every part of the room in which cars are displayed.

Personality in Sales

The second qualification is personality. A pleasant manner in meeting people, implying that the dealer is glad to have them come in to his place and that it is a pleasure to show his cars, is a potent part of straight salesmanship. If the dealer has no original appreciation of the value of business courtesy in selling, then he should acquire it, for it is something which every dealer can acquire if he will and it is worth while because it has a big influence in making sales.

In the smaller towns especially the location of the salesroom is of far less importance than are the appearance of the place and the personality of the dealer.

Mr. Agnew likens a dealer's territory to a farm. The territory may be rich or poor in prospects just as a farm may be rich or poor in soil. Cultivation is necessary in both instances. The farmer makes a study of his farm and adopts those methods of cultivation and grows those crops which are the best adapted to it. The dealer must study and analyze his territory in exactly the same way. He must put such sales methods into effect as will develop a crop of prospects in the best possible way. Results on the farm and in the territory depend directly upon the methods employed.

Just as the farmer also must discriminate carefully between the varieties of soil he finds upon his farm, so also must the dealer discriminate carefully between the varieties of prospects he finds within his territory. The dealer must size his prospects up. It is foolish to waste time trying to sell a car to a man who cannot afford to buy a car. Doing so is not only a waste of time and energy, but the sales expense relatively to the whole territory thereby is increased.

Another line of distinction which the dealer ought to draw is that between prospects for new cars and prospects for used cars. Experience has shown that it is comparatively easy to sell a used car to certain prospects when very heavy and stubborn sales resistance would have to be overcome in selling the same prospects new cars. The dealer will find it to his advantage thoroughly to analyze his territory and put his prospects each into the class where he respectively belongs.

In connection with an analysis of a territory, Mr. Agnew commends the map-tack system, regardless of whether the territory be large or small. This consists of a detail map of the territory pasted on a board. The location of every possible prospect is indicated by a tack of a certain determined color. When a sale is made the prospect tack is replaced by one of a different color. The advantage of this system is that the dealer can tell at a glance where his prospects are—and where they are not. It directs him in his efforts, both personal and in a publicity way. It enables him to concentrate either for immediate results or future results, according to his desire of the moment.

In addition, once a sale is made in any given locality, the total sales resistance offered by that district is reduced. A satisfied customer is a center from which radiates an influence favorable to the car the dealer sells, and a tack representing a sale, surrounded by tacks representing prospects, makes all these neighboring prospects more likely prospects. A glance at the map at any time will give the dealer a comprehensive survey of his territory, telling him what he already has accomplished and what still remains to be done.

Selection of Prospects

Mr. Agnew's advice for the selection of prospects is based first upon an accurate and intimate knowledge of a dealer's territory which can come only through a carefully taken census of all the farmers within the territory. Personal knowledge, gained by personal investigation, is to be supplemented by information derived from census reports, probate court records, local newspapers and so forth. He thinks the dealer should spend as much time as he can driving around his territory, making the acquaintance of the farmers and their material surroundings.

"Get acquainted with the farmers," he says, "not especially with a view to making immediate sales but to get on friendly

Perhaps you have forgotten how close it is to the 16th—and it is still closer to the 14th. The latter is the day that we have set for the special showing, to a few dealers only, of the new automobile we are to distribute. The 16th is the day it is to be shown to the public.

You have the reputation of being a far-sighted business man. That is why we believe you won't miss the opportunity to get in on the ground floor proposition with the uncertainty left out. When you have seen the car and driven it, we won't have to explain its wonderful sales possibilities. They are obvious. And when you learn who is building it, the surprisingly moderate price, and other details, you will be ready to do business on the spot.

We know you are busy, but just plan on investing one day with us. The enclosed card is for your convenience.

Yours for a busy year,

This letter was sent to 253 dealers and cost $12.64. Twenty-seven replies were received, resulting in thirty-three direct sales and four contracts

I want to take three short paragraphs of your time to tell you about something that is going to happen in this city on Thursday. Similar events have taken place here before, but none, however, that have awakened such an interest.

On Thursday we will show to the public a car that is destined to be a sensation. To tell you about this wonderful car would take pages and then you would have only our word for it. What we want is your approval and the approval of others who will ride in it and marvel at its performance and comfort. Their words, and not ours, will win for this new car a place as a great car.

But we did not write this letter to give you any description of the car. What we want you to do is to come, with a few others, to a private showing on Wednesday, the 15th. You will have ample opportunity then to inspect and ride in the new car. Let us know what time you can be here and I'll make sure of having the car ready for you.

Yours for a real surprise,

This form letter was sent to a list of 421 prospects, taken from the license records. The cost was $8.42. Eighteen replies were received

terms with them. Be a good mixer. Familiarize yourself with and manifest an interest in the personal affairs of your prospective customers. You can't know too much about them. Everything you do know becomes an asset."

New territory is worked more quickly, easily and economically by advertising, according to Mr. Agnew. This should take the form of well-worded advertisements inserted in local newspapers, circulars and personal letters. This implies the preparation and maintenance of a live mailing list.

Mr. Agnew himself is an advocate of the processed letter, filled in with the name and address of the prospect to match the type and color of the letter and beginning with "My Dear Mr. Blank" and, finally, signed by the dealer himself in ink. He admits, however, that there may be dealers who cover a relatively small territory who will not be sending many letters out at a time, hence the original written letter instead of the processed letter may be better for their purpose.

Regarding such letters Mr. Agnew can give some specific facts. For instance, there are reproduced herewith two form letters he sent out recently on the Essex car. One went to distributors and dealers; the other to local prospects. The results, measured by the costs, are interesting. He thinks the dealer will do well to consult his distributer about the form and wording of the letters sent out. He bases this advice upon the conviction that the distributer usually will have had a more varied experience, hence will be able to indite better sales letters than will the average dealer.

In a form modified to make them fit metropolitan conditions, these are just the principles upon which Mr. Agnew bases his work as sales promoter for the Twin City Motor Car Co., and these are the same principles which he is trying to institute in the business of the dealers in the territory controlled by the company. That they have proved successful is the very best warrant for their being logical and workable.

PHILADELPHIA SHOW

(*Concluded from page* 16)

that engine equipment will be optional.

Not much opportunity was given the exhibitors to get into action on the opening night, because there was some delay in finishing the decorations and there still were a dozen cars to be placed on the floor. The Cole and Liberty salesmen won distinction for themselves by appearing in evening dress, and the effect was remarkably good.

Peerless made special preparations for the show and although sales meetings are weekly occurrences, Gus Gantert for some time past has been educating the men to the value of show business, show connections and linking these acquaintances up for future business.

The new Ford sedan with the electric starter made its initial bow to the Philadelphia public.

The automotive equipment exhibits include considerable devices of interest to the dealer and garageman rather than owners. There is much shop equipment, special tools and other heavy equipment which does not interest the user.

SALESMAN'S DAILY REPORT

THIS REPORT MUST BE MAILED TO THE OFFICE DAILY
IF NO CANVASSING DONE, SO REPORT ON BACK, STATING REASONS
BE SURE AND MAKE A SEPARATE REPORT FOR EACH PROSPECT

..... 191....
City or Town State Date

.....
Name of Party Canvassed

.....
Street and Number or Postoffice

.....
Town and State

Canvassed for .....
Specify Year and Model—Also if New or Second-hand

.....
.....
.....

Price quoted $.....Terms payment.....
Sold him .....
Specify Model and Year—If no Sale, give reason

.....
.....

He should be canvassed again.....For.....
Give Date

.....
Give Model and Year

Upon inquiry, my impression of his financial standing is:

.....
Good Fair Poor

NOW OWNS .....
Give Size, Year, Model and Make—If purchased New or Second-

.....
hand—If trade, how much allowance is wanted?

Next year this party will be in the market for.....

Write or wire me:
Monday .....at.....
Tuesday .....at.....
Wednesday .....at.....
Thursday .....at.....
Friday .....at.....
Saturday .....at.....
Sunday .....at.....

Signature.....

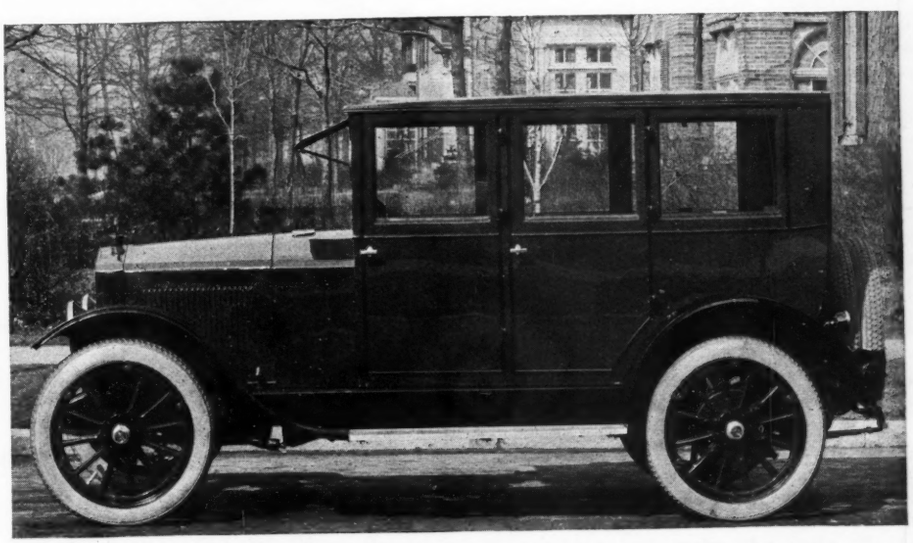
REMARKS:

.....
.....
.....

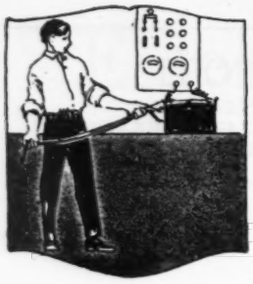
Daily report sheet used by the Twin City Motor Car Co.

The show has so fully come up to expectations that already plans are on foot to almost double the available space for next year's show by removing the wooden partition in the building and thereby adding 30,000 sq. ft.

The commercial show comes next week in the Museum and will include tractors, trailers and accessories, as well as trucks. In all there will be forty-nine exhibitors. All space was taken the week before the car show.



Essex is exhibiting its sedan for the first time at Detroit. It is finished in dark green, upholstered in dark gray whipcord. The car carries five passengers and will sell for $2,250



Electrical Equipment of the Motor Car

By David Penn Moreton & Darwin S. Hatch.

Editor's Note—Herewith is presented the 137th installment of a weekly series of articles begun in MOTOR AGE, *issue of June 29, 1916, designed to give the repairman and motorist the knowledge which will enable them to care for and repair any and all of the electrical features of the car, no matter what make or model it may be.*

The first half of this series has been published in book form by the U. P. C. Book Co., Inc., 243-249 West Thirty-ninth street, New York, and is sold at $2.50. The remainder of the series will be published as a supplementary volume.

Part CXXXVII—Remy Electrical Systems

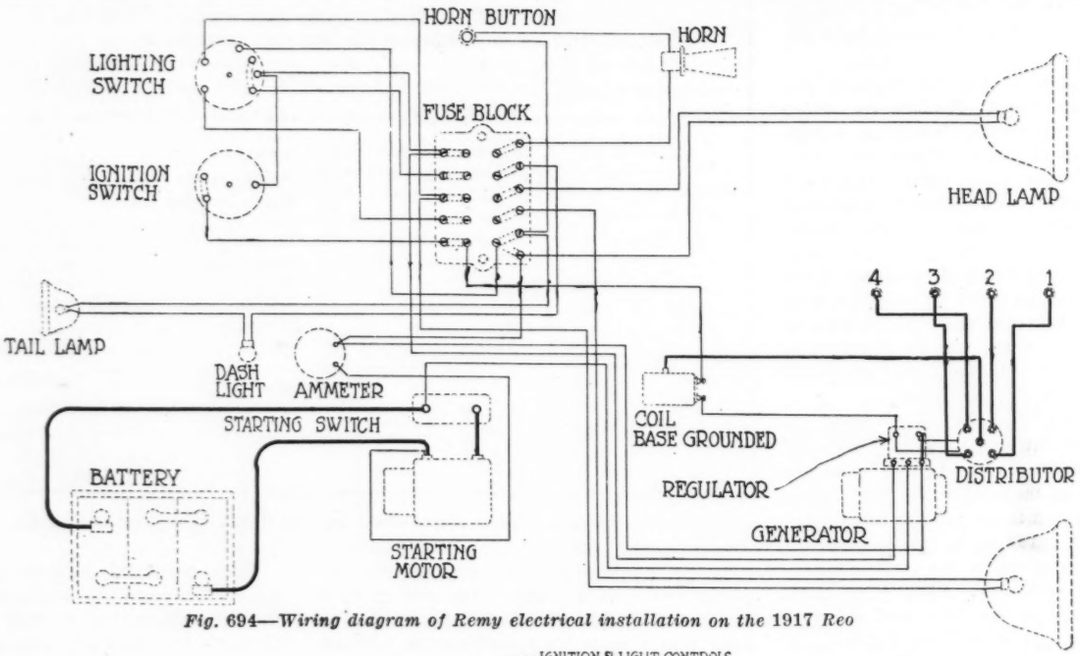


Fig. 694—Wiring diagram of Remy electrical installation on the 1917 Reo

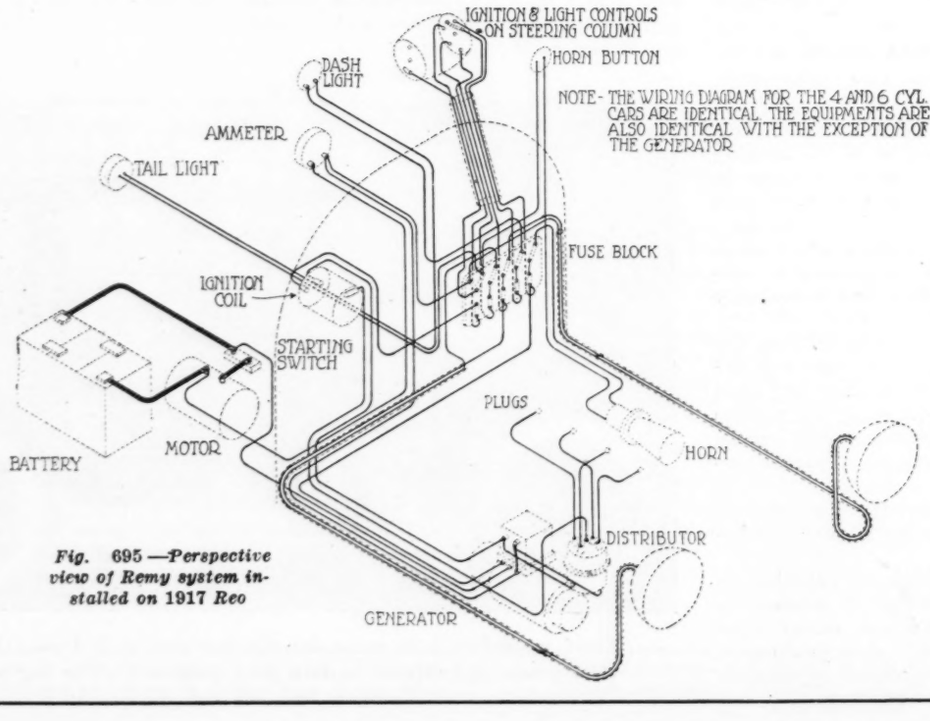


Fig. 695—Perspective view of Remy system installed on 1917 Reo

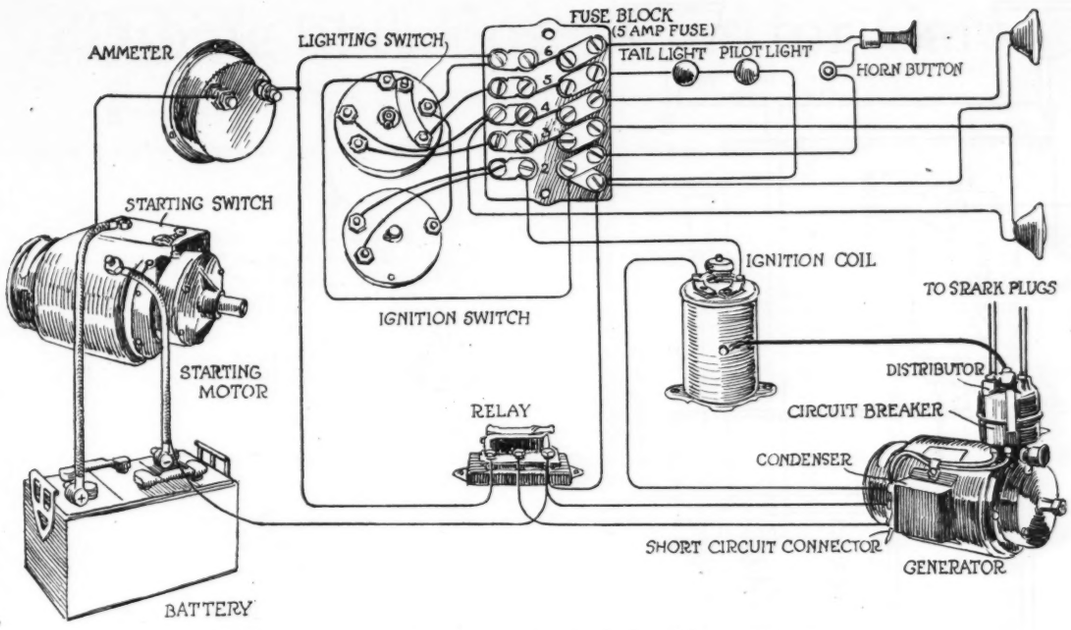


Fig. 696—Wiring diagram of Remy system on Reo, showing different units

A wiring diagram showing the connections of the Remy equipment on the Reo R four-cylinder is given in Fig. 694, and a perspective view of the complete installation is shown in Fig. 695. This is a two-unit, 6-volt, two-wire system. The output of the generator is regulated by a combination of the third-brush and thermostatic methods. The automatic cutout or relay is mounted separate from the generator, as shown in the figure. The ignition system is of the insulated type, and it is controlled by an ignition switch mounted on the dash. All the different circuits are fused except the starting motor circuit. A pictorial wiring diagram of the installation is shown in Fig. 696.

Power is transmitted to the engine from the starting motor by a chain drive of Reo design and a ratchet engagement operated by the starting pedal.

NEW YORK AERIAL SHOW

(*Concluded from page* 25)

resistance and tends to obviate nosing over when landing.

Thomas-Morse is exhibiting two military models, the S-4C army scout and the MB3 military model. The former uses an 80-hp. LeRhone engine and the latter a 300-hp. Hispano-Suiza engine. The latter made a record of 163⅔ m.p.h. at the flying field in Ithaca, the test being superintended by army officials. The Packard Co. also is exhibiting the La Pere plane, designed by the French aviation mission. The Curtiss training tractor is also on exhibition, together with the H. A. seaplane and the military model.

Interest at the Armory seemed to be centered on the German Albatross and the Navy's F-5-L seaplane, one of the largest flying boats in the service. This is exhibited with the covering of half of the boat and wings removed so the observer may study all such internal mechanisms as the bomb-release devices, instruments, controls, tanks, equipment, guns and ammunition racks. The Navy also has on exhibition the first dirigible used by the American forces abroad. This has an overall length of 221 ft. and an envelope diameter of 47 ft.

In addition to displaying the accomplishments of aeronautical and automotive engineers during the war, the war department's exhibit shows how the Air Service trained its aviators for foreign service. Principles of training, equipment and instruments used, motion pictures of actual work and the various machines which figured in the educational course of the pilot are being demonstrated.

Typical of those machines with the sporting appeal are Packard exhibit, the Curtiss M F two-seated flying boat and the L. W. F. hydroplane. These and others have a convincing ready-for-use aspect. While there are no large planes designed specifically for passenger- or freight-carrying purposes on exhibition, it is obvious the large Caproni, Handley-Page and Martin bombers, and the Navy flying boat easily could be adapted to these uses. The opinion seems to be that the readiest means of building up the industry on the part of the makers of the average-sized machines is in the appeal first to the private owner and for particular commercial uses afterward. Most of the two-seated planes and those designed for carrying two or three guns or bombs could be put into use as mail carriers with little change.

The lighter-than-air side of the industry also is represented, and there is evidence of the same optimism and planning for the future. Goodyear is showing an army fuselage for dirigibles equipped with a 100-hp. Curtiss engine, designed for 28 hr. continuous flight with four men aboard. This company also shows a scale model for a passenger car for a proposed dirigible with a cruising radius of 5000 miles without landing. This ship will be 450 ft. long.

SIXTEENTH HANDBOOK OF CARS

New York, March 7—In the sixteenth annual handbook of motor cars just issued by the National Automobile Chamber of Commerce are shown detailed and uniform specifications of the principal models of cars and trucks in the United States. The passenger car section shows 110 models, while the commercial section includes seventy. There are four models in the electric vehicle section.

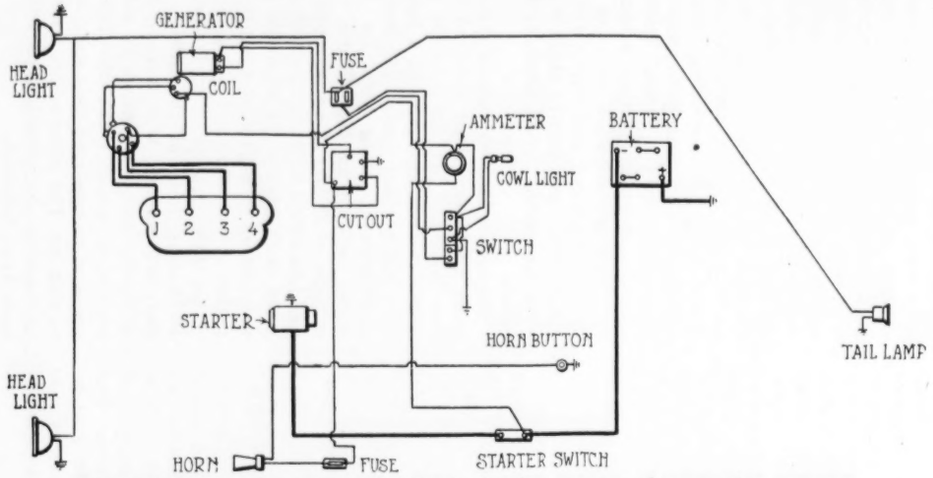
WISCONSIN TRACTOR MAKERS

Milwaukee, Wis., March 7—Wisconsin manufacturers of tractors, power farm machinery and other farm implements have entered a vigorous protest against the proposition before the state legislature that a special joint legislative committee be appointed to make an investigation to determine the advisability of establishing a general farm machinery manufacturing plant in connection with the state prison at Waupun or the state reformatory at Green Bay. At a hearing held recently representatives of regular manufacturers pointed out that the Federal Trade Commission is now engaged in an exhaustive, nation-wide investigation covering the same or similar ground, and that a state investigation would not only be shallow and inefficient but would be an unwarranted duplication.

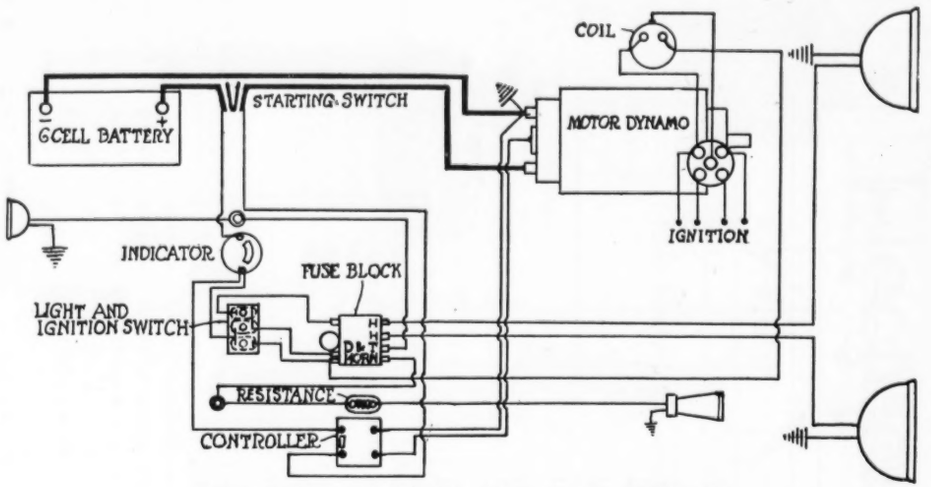
Reports were presented to show that the farm machinery plant operated in connection with the Minnesota state prison at Stillwater was operated at a loss of more than $15,000 last year. The fact that the establishment of a plant in Wisconsin would involve an expenditure of several millions of dollars at a time when the state could ill afford to make so great an investment, with highly questionable prospects, was offered in argument against the proposition.

One farm tractor manufacturer, Harry W. Bolens, head of the Gilson Mfg. Co., Port Washington, Wis., appeared in favor of the investigation which he said he was convinced would make the folly of the proposal so apparent that none would care to risk it. The state senate voted Feb. 28 in favor of the investigation and the protests have followed.

Motor Age Wiring Diagram Chart No. 19

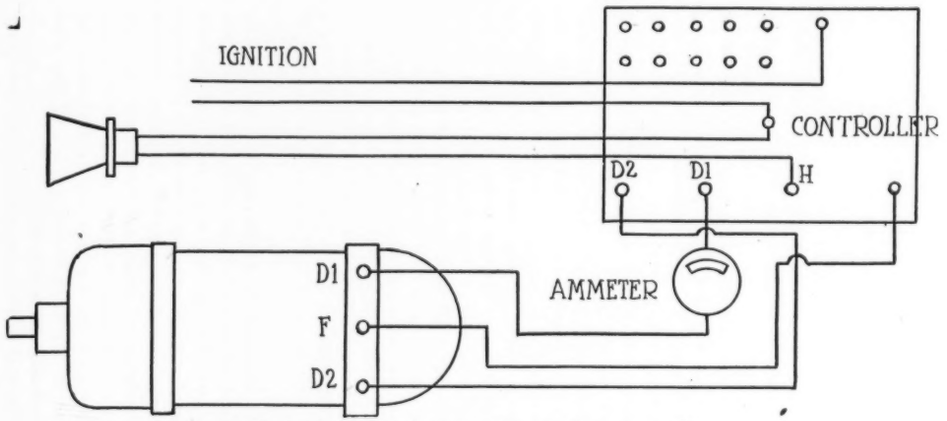


Westinghouse system on model 5 Dort, showing manner of connecting ammeter

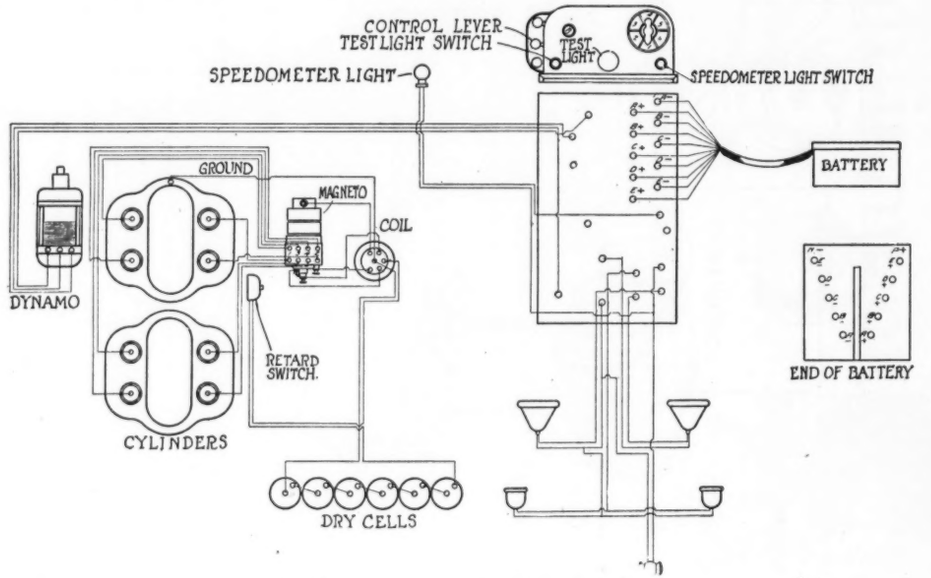


Remy starting and lighting system on the Empire 31

Alter—Nov. 14	Elgin—Feb. 27	Mercer—Jan. 23
Apperson—March 6	Ford—Jan. 30	Mitchell—Jan. 9
Buick—Nov. 21	Grant—Feb. 27	Oakland—Jan. 2
Cadillac—Dec. 19	Hudson—Dec. 5	Oldsmobile—Jan. 23
Case—Feb. 27	Hupmobile—Feb. 13	Overland—Nov. 7-14
Chalmers—Feb. 20	Krit—Feb. 6	Regal—Feb. 6
Cole—Jan. 23	Locomobile—JJan. 23	Reo—Feb. 27
Chevrolet—Nov. 28	Marion—March 6	Scripps-Booth—Dec. 26
Detroiter—March 6	Marmon—Jan. 9	Studebaker—Dec. 26
Dodge—Dec. 12	Maxwell—Jan. 16	



Method of connecting ammeter on Interstate 40



Apelco system on the Interstate 40

Tubing and Hose Sizes for Cars

Motor Age Maintenance Data Sheet No. 29

One of a series of weekly pages of information valuable to service man and dealer—Save this page

1912 Models

Car and Model—	Gasoline Tubing Diam.	Oil Tube Diam.	HOSE Diameter and Length (Upper)	HOSE Diameter and Length (Lower)
Cadillac	5/16	1/4	1 1/2 x 7 1/4	1 x 5 1/16
Case—M	3/8	5/16	1 1/4 x 5 3/8	1 1/4 x 9 7/8
Chalmers—10 & 12.	3/8	13/32	1 3/4 x 4 3/4	1 1/2 x 3 1/4
Chalmers—11	3/4	5/16	1 3/32 x 9 1/2	1 3/32 x 5
Chalmers—14	3/8	5/16	1 5/16 x 9 1/2	1 3/32 x 5
Cunningham	5/16	1/4	1 1/4 x 5 1/2	1 1/4 x 3 3/8
Davis—40	5/16	5/16	1 1/4 x 10	1 1/4 x 12
Dorris—G	5/16	3/8-5/16-1/4	1 1/4 x 3 1/2	None
Ford	1/4	3/8	2 x 3 1/2	1 3/4 x 2 3/4
Franklin—All	3/8	1/4	None	None
Haynes—21 & 22.	..	..	.....	.....
Hudson—33	3/8	1/4	1 1/2 x 5 5/8	1 1/2 x 4 3/4
Hupmobile—32H	1/4	5/8	2 1/2 x 8	1 7/16 x {13R / 15 1/4 L}
Inter-State—All	5/16	1/2 x 3/8	1 1/4 x 8 1/2	1 1/4 x 9
Jackson—52	1/4	3/8	1 1/2 x 7	1 1/2 x 11
KisselKar—F-12	5/16	1/4	1 x 9	1 x 7 1/2
KisselKar—H-12	5/16	1/4	1 x 8	1 x 8
KisselKar—D-12	5/16	1/4	1 x 7	1 x 8
KisselKar—L-D-12.	5/16	1/4	1 x 5 1/2	1 x 7 1/2
Locomobile—All	3/8	1/2	1 1/4 x 8	1 1/4 x 7
McFarlan—S	5/16	5/16	1 7/8 x 12	1 1/2 x 16
Mercer—35	5/16 & 1/4	5/16 & 3/8	1 1/4 x 9	1 x 13
Mitchell—All	5/16 & 3/8	5/16	1 1/8 x Various Lengths	
Moline—M35	5/16	3/16	2 5/8 x 10	2 1/4 x 13 1/2
Overland—58 & 59	1/4	3/16	1 3/4 x 3 3/4	1 3/4 x 7 1/2
Overland—60	1/4	3/8	1 3/4 x 4 1/2	2 1/4 x 6 7/8
Overland— 61	1/4	3/8	2 3/4 x 3	2 3/4 x 7 1/4
Packard—1-48	1/2	1/2	1 3/4	1 11/16
Packard—18	1/2	1/4	1 5/16	1 7/16
Packard—30	1/2	1/4	1 11/16	1 11/16
Paige—D & E	5/16	3/8	2	1 3/4
Pierce-Arrow—36-48.	1/2	3/8 & 5/32	1 1/4	1 1/2
Pierce-Arrow—66	1/2	3/8 & 5/32	1 1/2	1 7/8
Premier—V & W.	5/16	5/8	1 1/2 x 7	1 1/4 x 8 3/4
Reo—R & S.	1/4	1/4	1	1
Saxon	..	..	.....	.....
Stearns—SK4	5/16	1/4 & 5/16	1 1/2 x 4	1 1/2 x 6
Studebaker—S-20	1/4	5/8	1 5/8 x 10	1 5/8 x 2 3/8
Studebaker—A30	1/4	1/2	1 5/8 x 7	1 7/8 x 3 1/4
Stutz—A	3/8	5/16 & 3/8	1 1/2	1 1/2
Westcott—All	5/16	5/16	3/4 x 6	1 x 6
Winton—17-C	1/4	1/8 & 1/4	1 1/8 x 5 1/2	1 1/4 x 15

1913 Models

Cadillac	5/16	1/4	1 1/2 x 7 1/4	1 3/8 x 10
Case—N	5/16	5/16	1 1/4 x 4 3/4	1 1/4 x 7 1/2
Case—O	5/16	3/8	1 1/4 x 5 3/8	1 1/4 x 12 1/2
Chalmers—16	3/8	5/16	1 3/4 x 4 1/4	1 1/4 x 8
Chalmers—17	3/8	13/32	1 3/4 x 4 3/4	1 1/4 x 18 5/16
Chalmers—18	3/8	13/32	1 3/4 x 4 3/4	1 1/2 x 24 5/16
Chandler—14	5/16	1/2 & 1/4	1 3/8 x 8 1/2	1 3/8 x 13 1/4
Cunningham	5/16	1/4	1 1/4 x 5 1/2	1 1/4 x 3 3/8
Davis—All	5/16	5/16	1 1/4 x 10	1 1/4 x 12
Dorris—H	5/16	3/8-5/16-1/4	1 1/4 x 3 1/2	None
Ford	1/4	3/8	2 x 3 1/2	1 3/4 x 2 3/4
Franklin—All	3/8	1/4	None	None
Haynes—23, 24, 25.	..	..	Water pipe to pump, pump to radiator, top manifold to radiator	{1 1/4 x 1 3/4 / 1 1/2 x 4 1/2 / 1 1/2 x 7}
Hudson—37	1/4	1/4	1 1/2 x 4 1/4	1 1/2 x 8 1/2
Hudson—45	3/8	5/16	1 1/2 x 4 1/2	1 1/2 x 8 1/2
Hupmobile—32-H	1/4	5/8	2 1/2 x 8	1 7/16 x {13R / 15 1/4 L}
Inter-State—45	5/16	3/8	1 1/4 x 10	1 1/4 x 8 1/2
Jackson—All	1/4	3/8	1 1/2 x 12	1 1/2 x 12
KisselKar—F-13	5/16	1/4	1 1/2 x 10	1 x 8 1/2
KisselKar—D-13	5/16	1/4	1 3/8 x 8	1 x 9
KisselKar—H-13	5/16	1/4	1 1/4 x 8	1 x 8
KisselKar—LD-13.	5/16	1/4	1 1/8 x 5 1/2	1 x 7 1/2
KlineKar	..	..	.....	.....
Lexington—6-C	5/16	..	1 1/2 x 12	1 1/4 x 16
Locomobile—All	3/8	1/2	1 1/4 x 8	1 1/4 x 7
McFarlan—T-13	5/16	5/16	1 7/8 x 8	1 1/4 x 6
Mercer—35	5/16 & 1/4	5/16 & 3/8	1 1/4 x 9	1 x 13
Mitchell—All	1/4 & 5/16	1/4	2 x 7 1/2	{1 1/2 x 6 / 1 1/2 x 4}
Moline—M40	5/16	3/16	2 5/8 x 10	2 1/4 x 13 1/2
Oakland—42	5/16	1/4	1 1/2 x 8 5/8	1 1/4 x 11 1/4
Overland—69	1/4	5/16	1 3/4 x 3 3/4	1 3/4 x 7 1/2
Overland—71	1/4	1/4 & 3/8	2 3/4 x 3	2 3/4 x 7 1/4
Packard—2-48	3/8	1/4	1 11/16	1 11/16
Paige—F-1	5/16	3/8	1 1/2	1 1/4
Premier—W	5/16	5/8	1 1/2 x 7	1 1/4 x 8 3/4
Pierce-Arrow—C1 and B1	1/2	1/4 & 13/32	1 1/2	1 1/4
Pierce-Arrow—A1.	1/2	1/4 & 13/32	1 7/8	1 5/8
Reo—R & S.	1/4	1/4	1	1
Saxon	..	..	.....	.....
Stearns—All	5/16	1/4 & 5/16	1 1/2 x 4	1 1/2 x 6
Stutz—B	3/8	5/16 & 3/8	1 1/2	1 1/2
Westcott—40	5/16	5/16	3/4 x 6	1 x 6
Westcott—50	5/16	..	1 3/4 x 14	1 x 6
Winton—17-D	1/4	1/8 & 1/4	1 1/8 x 5 1/2	1 1/4 x 15
Studebaker—SA25.	1/4	3/8	1 5/8 x 6 1/4	1 7/8 x 5 9/16-1 7/16 x 47/8
Studebaker—AA35.	1/4	3/8	1 5/8 x 8 1/4	1 7/16 x 3 3/8-1 7/8 x 5 1/2
Studebaker—E-6	1/4	3/8	1 7/8 x 8 3/4	1 7/16 x 5 1/2-1 7/8 x 45/8

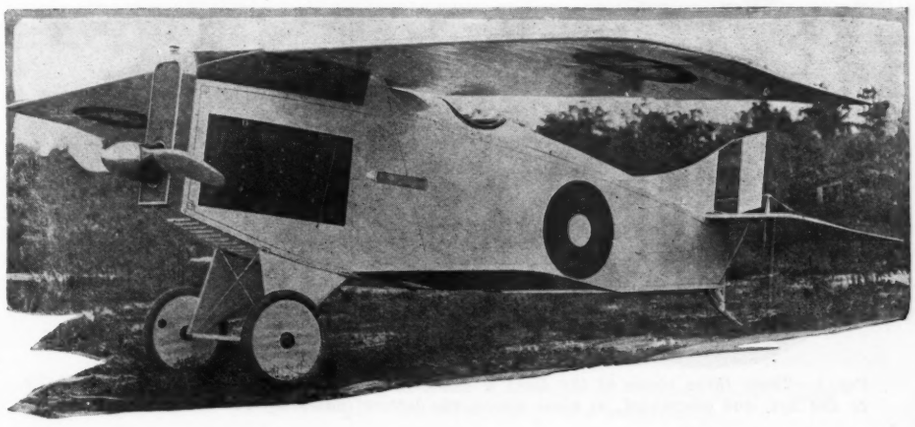
These measurements are taken on the outside for the gasoline tubing and on the inside for the hose tubing, unless otherwise noted.

An Aerial Mail Car

This is the Christmas Bullet, a strutless and wireless biplane which the Kerr Steamship Co. will use to deliver mail to its ships. It is believed it can deliver it from 24 to 36 hours after sailing. The mail will be carried in waterproof sacks and dropped on the decks of the boat.

For some years attempts have been made to perfect an airplane with flexible wings closely following the wings of a bird in design.

The plane is made by the Cantilever Aero Corp., New York. It is free of struts, cables and wires in the bracing of the wings, and there are no wires in the internal wing structure



The Readers' Clearing House

Questions and Answers

Conducted by B. M. Ikert

Borg & Beck Clutch

Q—Publish drawing of Borg & Beck clutch as installed on 1917 Murray eight.
2—Publish sketch showing clutch dissembled.
3—Is this particular clutch a dry-plate or dry-disk?
4—The clutch slips considerably and we cannot take a hill unless in second speed, sometimes in first. What is the cause of this, and what is the remedy? The clutch has been adjusted many times and will not work properly. —Alfred Lessard, Montreal, Quebec.

1 and 2—The Borg & Beck clutch is shown in Fig. 1.

3—Dry-plate.

4—If adjustment of the clutch brings no relief, then the disks are worn and should be replaced.

Detroiter Service Brake

Q—How can the service brake on the Detroiter B5 be made to work effectively? The brake and clutch are on the same pedal and the pedal will not push in farther than to throw out the clutch.—F. H. Kirchhoffer, Medical Lake, Wash.

Adjustment of the Detroiter service brake is made immediately back of the cross member of the frame. If you trace the brake rod back from the foot pedal, you will see it connects with a sort of rocker arm attached to the cross member. By backing up the locknut on the back section of the rod you will be able to turn the rod in either direction and so loosen or tighten the brake adjustment.

It will require a little experimenting to get this just right. Run the engine to determine just how far the pedal need be pushed to release the clutch. Then fix a block or stick of wood of sufficient length to hold the clutch in release position and allow the pedal to be moved forward another ½ in.; that is, that much play. Now jack up the rear axle and make the brake adjustment, trying the wheels now and then so that one holds equally as well as the other. You can, if desired, give a little more play to the clutch pedal, as experiment will direct.

Miscellaneous

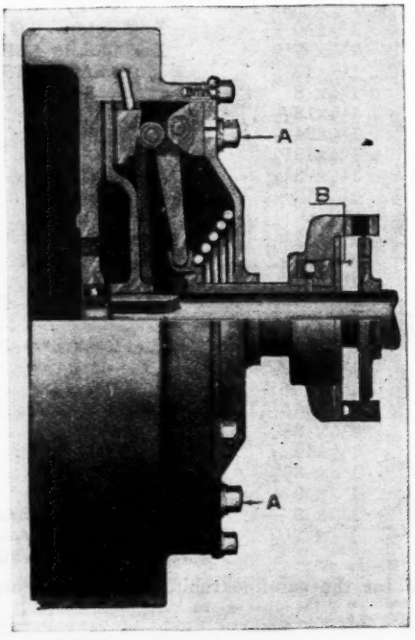
Clutch Does Not Work

Q—The clutch on my 1911 Chalmers does not work properly. I have trouble in getting the gears in, especially after the car has been idle for a few hours. The clutch does not disengage. Generally I let the gear in, push the clutch pedal way down and brace it from the front seat before I crank the engine. The trouble started when I oiled the clutch. What is the remedy?
2—What gear ratio has this car?
3—Is castor oil used in the crankcase?—Carl Rasmussen, Minneapolis, Minn.

The clutch is dragging. It needs adjustment. The oil you put in was probably too light, necessitating an adjustment.

2—Model M was made in three different models, roadster, touring car and limousine. The gear ratio for the roadster is 3 to 1, for the touring car 3¾ to 1 and for the limousine 4 to 1.

3—It can be.



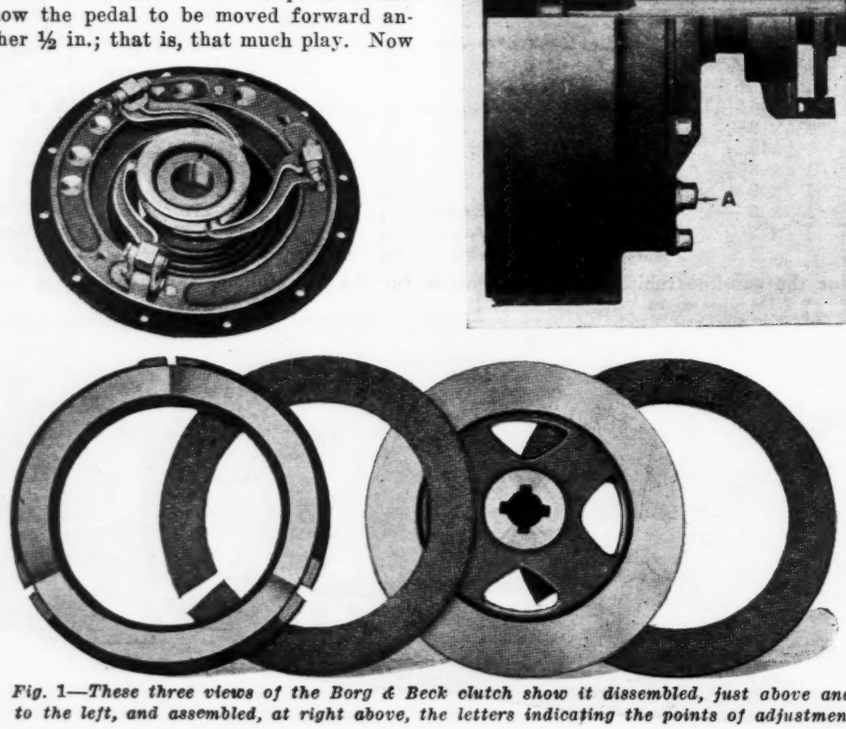


Fig. 1—These three views of the Borg & Beck clutch show it dissembled, just above and to the left, and assembled, at right above, the letters indicating the points of adjustment

Gear Ratios and Engine Speeds

Q—Give engine speed at 25 m. p. h. of 1918 Elgin six.
2—Give engine speed at 25 m. p. h. of 1918 Oakland six.
3—Give engine speed at 25 m. p. h. of 1918 Oldsmobile.
4—Give gear ratio in high of 1918 Elgin six.
5—Give gear ratio in high of 1918 Oakland six.
6—Give gear ratio in high of 1918 Oldsmobile six.
7—What is meant by a 3400 r. p. m. engine? —W. G. Gortzke, Mendota, Minn.

1—1360.

2—1200.

3—1235.

4—5.00 to 1.

5—4.500 to 1.

6—4.58 to 1.

7—An engine that has its maximum power at a speed of 3400 r.p.m.

Babbitting a Bearing

Q—Give instructions for pouring babbitt bearings on connecting rods and crankshaft?—Earl Caines, Ashland, Ky.

Secure a steel pin a little smaller than the diameter of the connecting rod bearing. Then lay the rod on a flat surface. It is better to place the rod on a pine board. In the center of the hole to be babbitted place this pin, and if the rod is laid on a board drill a hole in the board to fit the pin and center the rod around the pin. It is well to have the surface of the pin oiled or waxed. Then after the shaft is centered around the pin and secured so that a jar will not move it, the babbitt can be poured. The same method can be used for pouring connecting rod bearings. After the babbitt is cooled, the regular size wristpin is fitted by hand-scraping the babbitt to size, with the aid of prussian blue.

Magnetic Properties of Steel

Q—What is the theory for overcharged or supersaturated, permanent magnets? What change is made in the steel, or what effect has this on the molecules? How can one of these magnets be remedied so it can be used again?—Frank Cais, Aurora, Col.

Magnetic intensity, or ampere turns, is the means for charging magnets whether they be permanent or not. The more ampere turns, the more flux in the magnet. When steel is energized to a point where the magnetic lines of force equal 100,000 per square inch the steel is said to be saturated. Up to this point the addition of ampere turns added almost directly in proportion to the maxwells, or the lines of force. But beyond this point the addition of ampere turns is not so productive for an increase in the flux. So when a magnet is forced to these higher values of magnetization it is said to be supersaturated. This in no way impairs the value of the steel as a magnetic agent, except after a long

time at these high values the steel seems to age and its retaining power wanes. There is no remedy for this. People grow old and will continue to do so until the fountain of youth is found, so will steel when exposed to magnetism grow old without being able to be renewed.

Adjusting Steering Gear

Q—Give instructions for tightening steering wheel on model 24 Buick roadster. I have new brass bushings in now. When I tighten the tightening nut I cannot turn very short.—R. H. Schatz, Minot, N. D.

This car is equipped with an old type of steering gear, and it should be adjusted with the wheels cramped over as far as they will go. Take out the brass bushing or loosen it, and turn the wheel as far as it will go, also force the wheels over to the extreme position, and then adjust the nut for riding tension.

Specifications of Resta Special

Q—Publish complete list of Junior speedway records, time, place, driver, etc.
2—What should the wheelbase be on a Junior racer using 28-in. wheels with an underslung frame and having a 36-in. tread, most of the weight and strain being on the rear end?
3—Publish side view of Resta's Special.
4—Publish view of engine in Resta's Special.—Harold Lain, LaPorte, Ind.

1—This data is not available.

2—The wheelbase is generally about 90 in. maximum.

3-4—We do not have these but the specifications are: Engine, Resta Special; cylinders, four; size, 3.67 by 6.750; valves, 16; location, head; camshafts and location, two overhead; carbureter, Miller; ignition, Bosch; plugs and number, KIG, four; oil, Oilzum; wheelbase, 106.

Starter Breaks Flywheel Teeth

Q—The gear of the starting motor rips the teeth off of the flywheel of my 1916 Maxwell 25. I am going to replace the flywheel and wish to avoid a recurrence of this trouble. Can you suggest a remedy?
2—While the gearcase is off I wish to replace the felt oil retainers. Illustrate where same are located.—J. J. Jerome, Bedford, Ohio.

1—No trouble should be experienced if the starter shaft is in proper alignment so the gears mesh properly. Care should be used when the engine starts to allow the starter pedal to return so that the gears will be disengaged immediately. Holding the gears in mesh after the engine starts is the most common cause of flywheel teeth stripping.

2—The Maxwell clutch and transmission are illustrated in Fig. 2. The oil-retaining washer is dotted in black.

Removing Maxwell Clutch

Q—How can I get at the clutch thrust bearings or clutch gear bushing on my 1917 Maxwell 25? A grinding or grating noise seems to come from the clutch housing and can be felt on clutch pedal when throwing the clutch in or out. It appears to be either in the thrust bearing or one of the other main bearings in this part and is getting worse. There is a decided metallic knock when the engine is working hard at a slow speed and regardless of position of spark, whether retarded or advanced. I can feel a jerk at the gearshifting lever when the machine is running but the grinding noise is not so distinct when the clutch is thrown out.
2—Can I get at the clutch thrust bearings or clutch gear bushing without removing the engine?—H. S. Knight, Benton Harbor, Mich.

1—This case has two faults. First the rear main bearing of the engine is worn. The pound of the engine is caused by the flywheel and the shaft being moved rapidly up and down in the bearing at the rear of the engine. The remedy for the pound is the removal of several shims in the rear bearing. The grinding noise is caused in the clutch bearings and the transmission gears. There is probably dirt and dust in the housing, together with old oil and grease. A very good method to remove this is to take off the top cover plate of the transmission, remove the drain plug at the bottom and then pour through several times boiling hot soap suds. This will remove all the grease and dirt but some soap will be left to be got out or it will spoil the lubricating oil. So rinse very thoroughly with hot water, and then with a cloth or sponge remove the water in the pockets of the housing.

2—Refer to Fig. 2. First remove the bolts holding the universal joint together. Take the universal joint collars off the cross of the joint, slide the collar back on the splined joint and then let the shaft and its tubular housing down. Next remove the bolts which hold the transmission to the engine. It is wise to support the transmission during this operation so it will not strain the bolts holding it while it is being removed. After all the bolts are removed, the transmission can be pulled out. The transmission is quite weighty, and care should be taken to see that it can be swung free when its weight is no longer supported by the engine. After this is off the clutch release bearing can be taken off. Then take off the nuts holding the springs of the clutch, which will allow the clutch to come off. This immediately exposes the clutch thrust bearing.

TO assist readers in obtaining as a unit all information contained in this department on a certain subject MOTOR AGE segregates inquiries into divisions of allied nature. Questions pertaining to engines are answered under that head, and so on.

MISCELLANEOUS.

Alfred Lessard.....Montreal, Quebec.
W. G. Gortzke.....Mendota, Minn.
Earl Caines.....Ashland, Ky.
F. H. Kirchhoffer..Medical Lake, Wash.
Carl Rasmussen.....Minneapolis, Minn.
Frank Cais.....Aurora, Col.
R. H. Schatz.....Minot N. D.
Harold Lain.....LaPorte, Ind.
J. J. Jerome.....Bedford, Ohio
H. S. Knight.....Benton Harbor, Mich.

LUBRICATION.

W. M. Bramhall.....Paris, Tex.
W. J. Roberts.....Ishpenning, Mich.

CARBURETION

H. P. Murphy.....Chicago
W. C. Brauch.....Dayton, Fla.

THE ELECTRIC SYSTEM

O. P. Blair.....Toledo, Ohio
John Werner.....Chicago
O. Schalin.....Galesburg, Ill.
Roy Carpenter.....Walla Walla, Wash.
H. P. Murphy.....Chicago
F. H. Kirchhoffer..Medical Lake, Wash.
J. W. Haseltine.....Cawker City, Kan.
J. Bernstein.....Youngstown, Ohio
H. H. Wright.....Red Bluff, Cal.
Morris Ferguson..Salt Lake City, Utah

REBUILDING

Philip Miller.....Danville, Ohio
Richard M. Boren.....Philadelphia, Pa.
A. A. Davidson.....Cohoes, N. Y.

No communication without the writer's name and address will be answered in these columns.

Lubrication

Cause of Oil Pumping

1—What causes oil to flow past cylinder rings?
2—Would patent rings remedy this?
3—Would it pay to put new rings in the cylinder and fit oversized piston and light connection rods?
4—Give estimate of cost of same.—W. M. Bramhall, Paris, Tex.

1—Several things are responsible for oil passing by the piston rings. Of these the following are most common: Scored cylinders, scored pistons, worn or poorly fitted rings, worn pistons or cylinders, improper valve timing and bent connecting rods. Of course, an over-supply of oil or the use of too light an oil will cause this trouble.

Before attempting a remedy a thorough inspection should be made of the entire powerplant to ascertain just which ailment is responsible. If the engine is of that type, remove the head. Crank the engine until any piston rests on lower dead center. Clean the cylinder wall thoroughly with kerosene and observe whether scratches or deep cuts are evident. Do this with each cylinder. If scratches or cuts are visible on the cylinder walls, it can be taken for granted the pistons and rings also are cut, and it will be necessary to remove them.

If the cylinder walls are found to be free from blemish crank the engine again until any piston rests top dead center. Place the hand on the top of the piston and try to

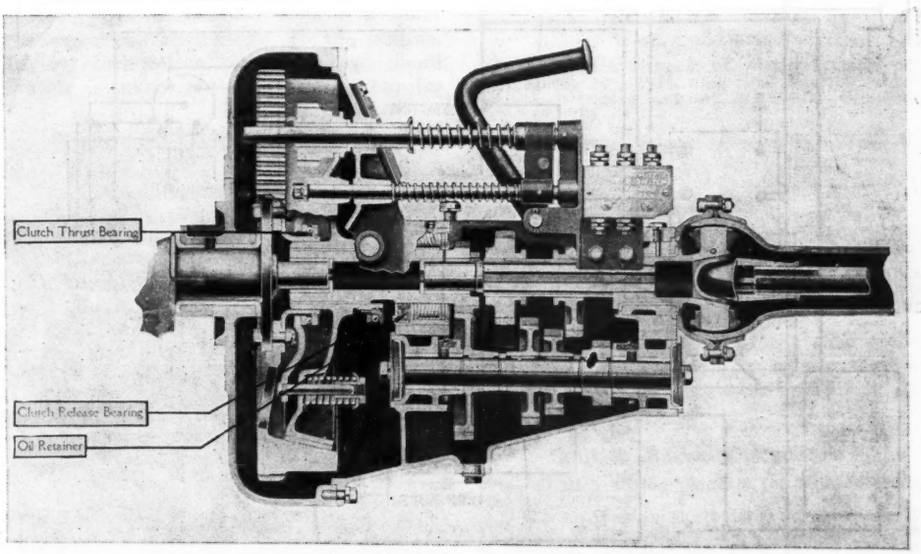


Fig. 2—Clutch and transmission on 1916 Maxwell, showing oil-retaining washer which separates the clutch housing from that of the transmission

move it from one side of the wall to the other. If the piston shows it has more than 0.005 or 0.006 in. play, it is certain the pistons and cylinders have worn to the extent that oversize pistons are necessary. To be accurate it would be necessary to measure the cylinder walls at different angles throughout the depth of the cylinder. This is done with inside micrometers. The result is very apt to reveal the cylinder is worn egg-shaped, as it commonly is termed. If the pistons or cylinders are scored or if the cylinders are worn egg-shaped, it is necessary to regrind the cylinders and fit new pistons. If the cylinders are not too badly worn or the scratches not too deep, it is possible to procure a satisfactory job by lapping or grinding. If the cylinders are in such condition that this operation will not bring them back to perfection, it is necessary to rebore them.

If the pistons and cylinders are in apparent good condition, try the rings for wear or poor fit. To do this requires that the pistons be removed. While the piston is out carefully observe whether it indicates a bent connecting rod, shown by a discloration resulting from heat on the upper side of the piston and a like discoloration on the bottom and opposite side. This defect, besides permitting oil to pass the rings and wearing the cylinder out of round, will cause an engine knock which is very hard at times to locate. Clamp the connecting rod in a vise and grasp the piston preparatory to working it up and down to determine excessive wear at that point. Remove the piston rings and place them in the cylinder. A gap of not more than $\frac{1}{64}$ in. should be allowed, and if more than that is noticed the ring is useless.

If the cylinders require reboring or regrinding, new pistons and rings will be necessary. The pistons when properly fitted will leave 0.004 in. to 0.005 in. clearance.

2—Any type of a good patented ring may be used, but whatever type is chosen the choice should be made before having the pistons made. A great deal of care must be exercised in assembling the engine, and no less care should be exercised in breaking it in after it is assembled. If it is not necessary to rebore or regrind the cylinders, it is evident replacing the rings should give good results if the work is done properly. First clean all carbon and dirt out of the piston ring grooves. Then roll the ring around the entire circumference of the piston grove. In doing this any high spot of the ring will be detected and can be dressed down to an accurate fit.

If the width of the new ring is not sufficient properly to fill the groove of the piston, it will be discovered. The proper clearance to allow between the side of the ring and the supporting edge of the groove is 0.001 in. Having done this place the ring in the cylinder and note the fit. If a plain ring is used, it may be dressed down with a file until the proper clearance has been allowed. Place all rings on the piston as they are fitted so as not to have a ring on one piston which was fitted for another. Before replacing the pistons they should be dipped in oil to prevent any possibility of their tightening up and scoring before oil from the crankcase has a chance to reach them.

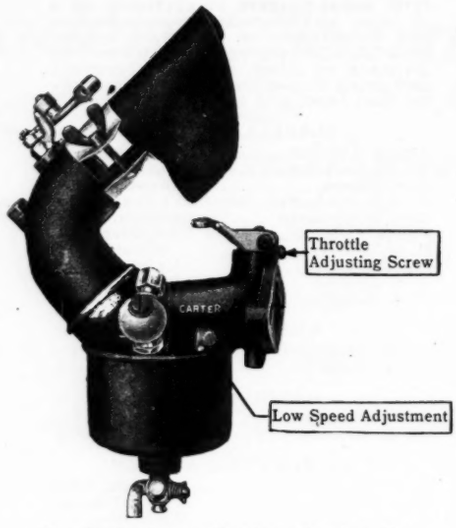


Fig. 4—Carter carbureter, showing the points of adjustment

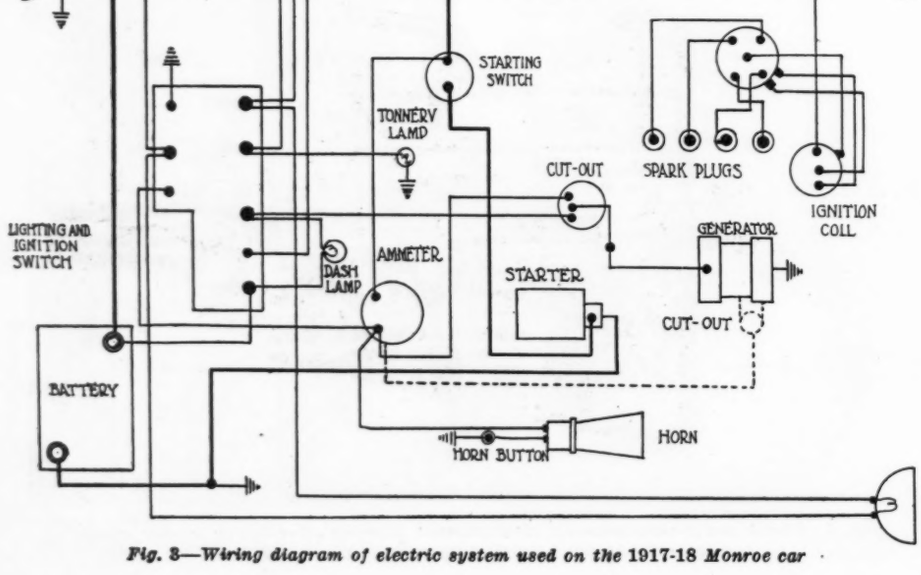


Fig. 3—Wiring diagram of electric system used on the 1917-18 Monroe car

3—Unless you intend rebuilding your engine for speed it would not be advisable to go to the expense of installing lighter connecting rods, and even though you are contemplating a speedster light connecting rods hardly would make a noticeable difference unless the engine generally was rebuilt for the purpose.

4—To estimate the cost of the work necessary on your engine would require that we know what make of engine you have and also to what extent the repairs mentioned are to be carried out.

Cylinders Pump Oil

Q—My Oakland 34 B is somewhat of an oil pumper and in consequence the spark plugs have to be looked after frequently. I expect to take the engine down, clean the carbon, grind the valves, etc., and am contemplating installing a full set of patented rings to see if the oil cannot be prevented from entering the combustion chamber. The engine has aluminum pistons and the clearance necessary to aluminum seems to be the cause of the trouble. What in your judgment would be the best piston ring to use for this purpose?

2—What groove of piston should it be used in, top or second?

3—Would there be any danger in changing the temperature of the engine on account of difference in compression?—W. J. Roberts, Ishpenning, Mich.

Remove the piston and examine the rings for small portions which may not have had a bearing on the cylinder wall. The rings at these points will show a discolored surface which is the result of the exploded gas flame burning them, and because the ring has no bearing on the cylinder it is not polished off through the friction of the rings on the cylinder wall. This may be caused by the ring itself not possessing a perfect surface or by the cylinder not being exactly round. To determine whether the cylinder is out of round, measure its diameters from a number of angles and position with a micrometer. If, after accurately measuring them, it is found that there is a variation of more than 0.002 or 0.003 in. it can be taken for granted that unless the cylinders are reground and trued up no ring will give complete satisfaction.

Unless the shop is properly equipped for the job of accurately fitting rings it would be to your advantage to send your pistons to a reliable concern who manufactures aluminum pistons and special rings for them. Give them the exact diameter of each cylinder and mark the pistons 1, 2, 3, etc., as they are taken from the cylinders so no mistake will be made in replacing them. A great deal more care is required in the fitting of rings on aluminum pistons than is required of the cast-iron pistons, and the majority of mechanics are not thoroughly familiar with the proper clearance allowance necessary.

2—If you decide to do the job yourself, fit a patented ring in both grooves.

3—If compression has been lost on account of poor fitting rings and it is overcome by installing new ones, there is no doubt the temperament of the engine would be changed for the better.

Carburetion

Carbureters and Olympian

Q—Is it possible to use a Zenith carbureter on my four-cylinder 1917 Olympian motor car and what model?

2—If not, what other make carbureter would you suggest and what model? This car has a Carter carbureter and I can find no way to adjust it.—H. P. Murphy, Chicago.

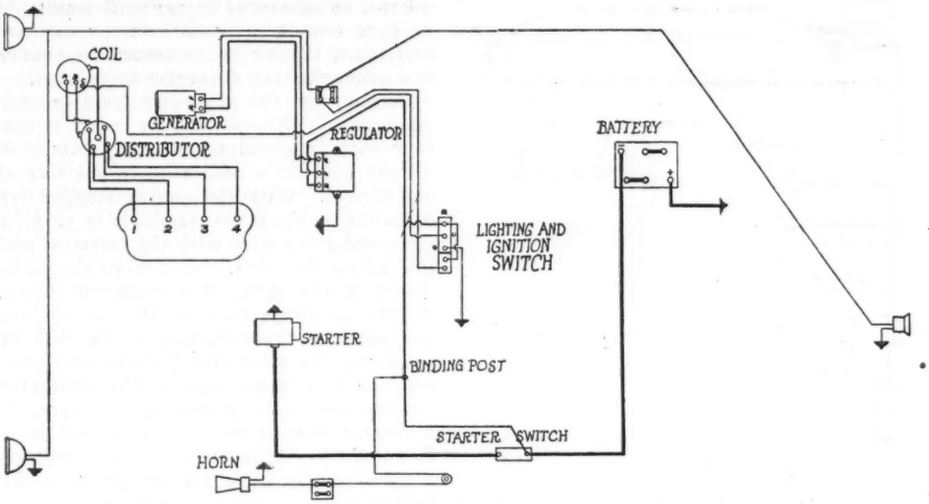


Fig. 5—Wiring diagram of Westinghouse starting and lighting system used on Dort

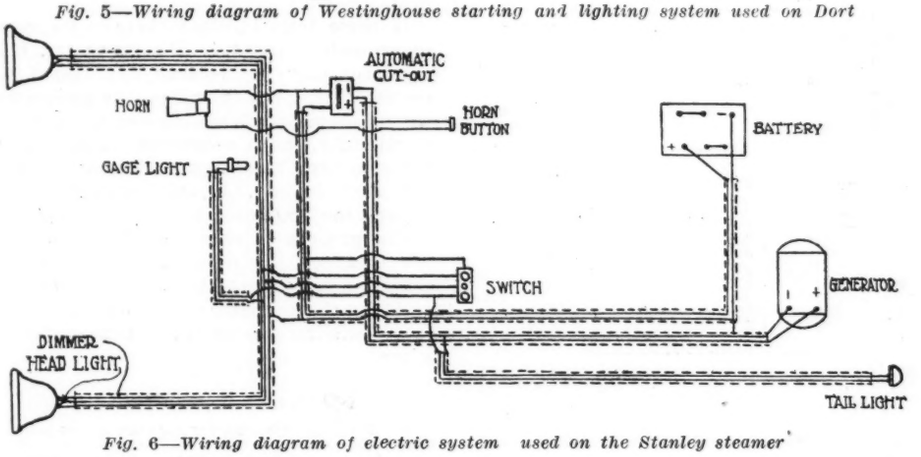


Fig. 6—Wiring diagram of electric system used on the Stanley steamer

1—Yes. Same size as your present carbureter.

2—While the Carter carbureter is designed to be entirely automatic and should not need adjustment, there will be found a thumb screw up close to the outlet of the carbureter. This is low-speed adjustment. The high-speed cannot be adjusted, as it functions automatically. An illustration of the carbureter is seen in Fig. 4. This adjustment is made when the engine is idling. Turn this thumb screw in until the engine starts to miss and backfire due to the lean mixture. Then slowly turn the screw out until the engine hits properly on all cylinders. If the engine tends to run so slowly it stalls, turn the throttle adjusting screw until the engine speeds up just enough to allow it to idle nicely and with regularity in its firing.

Value of Extra Air

Daytona, Fla., Editor MOTOR AGE—You no doubt have had inquiries regarding the advantages of the air vent between the carbureter and cylinders. To satisfy ourselves whether it was an advantage, we drilled a $\frac{3}{8}$-in. hole in the Wilmo manifold on a 1912 Ford. We connected a ½-gal. can with a rubber hose to the carbureter after disconnecting the main line and drew off all the gasoline from the carbureter, poured in 1 qt. of gasoline into the can, cranked the car by hand, and away we went. The day was quiet, practically no wind. We traveled about 20 m. p. h. and when we came to a stop we went 7.3 miles on one measured quart or 29.2 m. p. g. with the air cock open. We came back under the same conditions and made only 23.8 miles with the valve closed, a difference of 5.4 miles. I have asked many people, and several have said, "no gain, just a nuisance; wouldn't bother with it." Others have said it makes the engine run faster and used more gasoline. They evidently never tried it out. While I am no mechanic, I can see the gain. The suction is less through the carbureter when the air valve is open and while on a thinner mixture the engine gains in speed and saves gasoline. We tested this on asphalt roads.—W. C. Brauch.

One does not have to be a mechanic to appreciate the gain of 5.4 miles from one gal. of gasoline. If an analysis were conducted of the exhaust gas as it emerged from the engine, one would find that the percentage would be less when the air vent was open then when it was closed. Carbureters as ordinarily designed cannot provide for an absolutely perfect combustion within the cylinder, because conditions are constantly varying. The combustion within the cylinder does not occur two times the same the entire life of the engine. Perfect carburetion cannot be had if all the air is taken in through the carbureter passages, because the air velocity then will become so high the quantity of gasoline so drawn in will be greatly in excess of the required amount.

To overcome this some carbureters have had auxiliary air valves incorporated into their design. This is satisfactory for one of the many high speeds but if the engine speed increases above the designed speed, then the opening proves insufficient for perfect combustion. To compensate for this more and more auxiliary air passages would have to be provided as the engine increases in speed. This is where the advantage of the opening in the manifold is of benefit. At low speeds the opening becomes a serious detriment, as it is at these speeds that power is needed and a rarifying of the mixture is not productive of increased power.

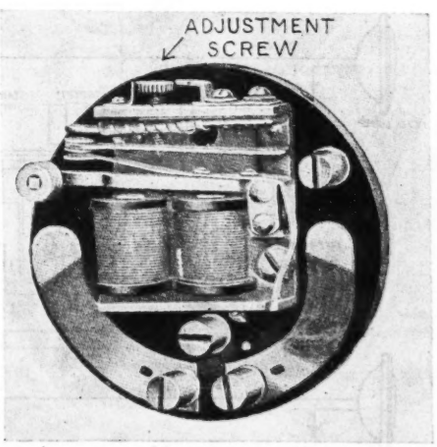


Fig. 7—Where to adjust Connecticut automatic switch

The Electric System

Trouble with Hupmobile Ignition

Q—I have a Hupmobile 1916 model Atwater Kent K2 ignition system. It seems to run perfectly at times, but stops suddenly and has no spark at contact points. By working switch and then working contact points back and forth contact again can be produced. Is this caused from a poor switch, short-circuit or generator.

2—Publish diagram of this ignition system.—O. P. Blair, Toledo, Ohio.

1—The trouble is in the igniter. Inspect and clean the contacts. See that no oil is present on the igniter points.

Adjust the clearance of the contact points to 0.010 in. to 0.012 in.

It is possible also that there is loose connection in the switch.

2—The diagram of the 1916 Hupmobile is shown in Fig. 9.

Diagram of Stanley

Q—Show wiring of Stanley steamer and Doble-Detroit cars.—John Werner, Chicago.

A diagram of the Stanley steamer is shown in Fig. 6. This is a two-wire system, and it will be noted that the steam car presents a very much more simple system of wiring than the gasoline car, even if a two-wire system is used. Doble does not wish as yet to have any diagrams published, but a technical manual is under way which will explain these many questions on the Doble car.

Wiring of Dorts

Q—Publish a diagram of wiring systems of Dort motor car, 1915 and 1916 models. The storage batteries are 12 volt.—O. Schalin, Galesburg, Ill.

These systems are shown in Figs. 5 and 8.

Lights Are Dim

Q—When the engine on my four-cylinder 1917 Olympian motor car is running, the lights are very dim, but if the clutch is thrown in and the engine run idle they get bright again when the engine is running fast. What is the trouble?—H. P. Murphy, Chicago.

Probably the battery is low. Also probably the generator cuts in at too high a speed. Adjust the regulator to cut in at lower engine speed.

Ignition Button Disconnects

Q—Publish wiring diagram for Monroe roadster.

2—In pushing in the button on the dash it kicks out unless held in place until the engine is running. Possible the wires have been connected incorrectly in rebuilding. What causes it?—Roy Carpenter, Walla Walla, Wash.

1—This diagram is shown in Fig. 3.

2—The wires are not connected wrongly, but a slight adjustment is necessary. Referring to Fig. 7, the little adjustment screw which is shown must be screwed out to allow more room for the thermostatic control to expand when the current is turned on and the engine not going.

Recharging Ford Magnetoes

Fresno, Cal., Editor MOTOR AGE—In your issue of Dec. 19 under this heading you state the north pole of the compass needle should point toward the engine. This, I take it, would mean the pole marked N.D., not the true north pole of needle. In "Ignition, Timing and Valve Setting" by Russell and Rathburn, they state that it must be the blue point or south pole of compass pointing toward engine. One or the other is wrong and I think you are. It should be corrected as if you reverse the magnetism of magnets it will ruin them.—Edward S. Palmatier.

It is the north pole of the compass that should point toward the engine. Here is the way to carry out the job. Place the car in a due east and west position and then place a small compass to the left and about 3 or 4 in. back of the magneto terminal. Then have someone slowly crank the engine until the north pole of the needle points directly toward the engine. The magnets are then in line for receiving the charge.

Ground Positive or Negative?

Q—Does it make any difference whether the positive or negative pole of a storage battery is ground to the frame?

2—Could one use a DU4 magneto on a single-cylinder engine by using one spark plug wire on distributer of magneto?

3—Could a K-W impulse starter be used on a Bosch magneto?

4—Is there any company that makes a starter coupling that would fit a Bosch magneto other than the Bosch company. The Bosch magneto, with impulse starter, is too long for the space I have for magneto?—J. W. Haseltine, Cawker City, Kan.

1—The positive pole should be grounded to the frame, but if in an exceptional instance the generator is wired in reverse of the usual custom, of course, the negative should be grounded. The S. A. E. recommends grounding the positive.

2—A DU4 magneto may be installed on a one-cylinder engine but it must be properly geared so the same point of the distributer will deliver a spark on each compression stroke of the engine.

3—With sufficient alteration, this could be done.

4—We do not know of anyone making a magneto coupling to fit the Bosch except the Bosch.

Packard Regulator

Q—Show cross-section view of the regulator used on the generator of 1916 and 1917 Packards. Is this a type of bucking coil regulator? What is the idea of turning the handle on this regulator every 1,000 miles? Is there any method of testing these regulators so as to judge if the trouble lies in the regulator or generator in case the generator fails to charge?—J. Bernstein, Youngstown, Ohio.

MOTOR AGE has no cross-sectional view of the regulator, and neither can Packard supply one, for the reason that one of these views would be of very small value and would not show the wiring connections. The regulator is not of the "bucking coil" type, but is of the vibrating type and operates by holding the generator output at a constant voltage. The simplest method of determining whether electrical trouble lies in the generator or regulator is the replacement of the regulator itself with a unit known to be correct. This can be done very easily, as a regulator easily is removed. If no unit is available, the generator itself may be tested in the following manner, all these tests being made with the regulator disconnected:

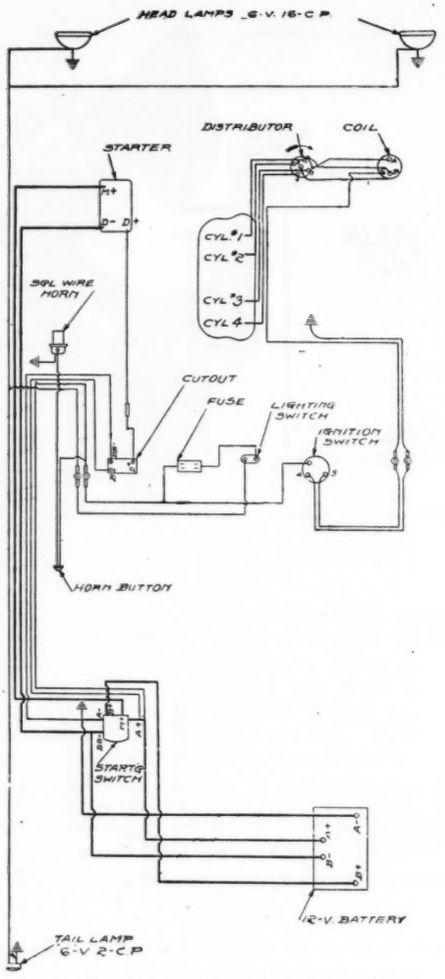


Fig. 8—Wiring diagram used on 1915 Dort roadster

First, test the generator for an open circuit with the engine running. This is done by shorting across the terminals at the top, so as to connect every combination of terminals, that is, connect 1 and 2, 1 and 3 and 2 and 3. In each case a flow of current should be indicated. It is well to use a 7-volt bulb in trying these connections, as a direct short-circuit is apt to injure the generator. The engine should be run only at low speed with the regulator disconnected, as otherwise injury will result. If an open circuit is shown between any two terminals, it may be necessary to remove the generator for a careful inspection.

Second, test the generator for a grounded circuit. This is done by using a battery with two cables and test points with a light bulb for a resistance in one side of the circuit. With the engine stopped try each one of the three terminals in turn by connecting one wire with the terminal and grounding the other. No current should be shown in any case. If a ground is shown, it may be determined whether or not the ground is in the armature or the field by removing the generator brushes and placing one test point against the generator commutator while grounding the other. If a current flow is shown, the ground is in the armature itself, while if no flow is indicated by the bulb, the ground is in the field.

If these tests indicate there is no open or grounded circuit in the generator, the regulator may be replaced and tested to see whether it is controlling the generator output properly. With the engine running about 900 r.p.m., a voltmeter placed across the generator brushes should show a reading of 7.75 volts. If this reading is not shown, the regulator should be replaced.

The purpose of reversing the switch at the front of the regulator is to reverse the flow of current through the vibrator points in the regulator to prevent one point from building up at the expense of the other.

Generator from Magneto

Q—Give instructions for making a small generator to put on a Ford to charge the 6-volt storage battery from a National C-4 magneto. I want to run this generator off the fan drive pulley with a double-belt arrangement. What size wire should be used in winding the armature? How should this be done, and how many segments should be put in the commutator? Should the armature be made of thin disks or solid iron?—H. H. Wright, Red Bluff, Cal.

It is hardly possible to give in our limited space full and complete instructions for the construction of a generator from a magneto. First, it will be necessary to construct the field coils around the permanent magnets of the magneto. The method of regulation you will wish to use must govern the design of these coils. If you wish an inherently regulating type of generator then you must use differential field winding, one that has a series field opposing the shunt field. Then, depending upon the choice of field winding, will depend the

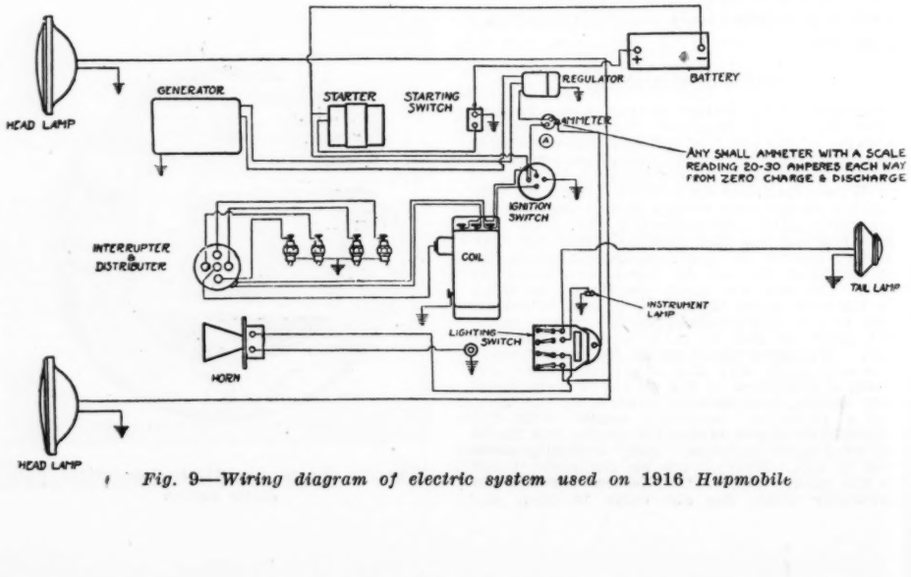


Fig. 9—Wiring diagram of electric system used on 1916 Hupmobile

armature winding. The armature core by all means should be made laminated. Considering all these things, it will be cheaper for you to buy a small generator of about 60-watt capacity.

Gears and Axles

Q—The gears of intermediate speed on my 1916 Maxwell 26 slip out of mesh when on a hard pull. I have been advised the trouble lies in bent shifter forks or worn gears. In either case please tell me how to remedy the trouble.

2—There is a grinding noise in the rear axle, most prevalent at 15 to 20 m.p.h. I believe it is either misalignment of the gears or worn gears. Tell how to install new gears and make the necessary adjustments.

3—What is the address of the Simms Magneto Co.?—Morris Ferguson, Salt Lake City, Utah.

1—Bent shifter forks or worn gears is not the cause, in all probability. Look to the retaining bearing on the countershaft. Move the set screw in at the rear of the transmission housing after moving the set screw at the forward end out. This will move the whole shaft farther into place. It might be the bearing in the pocket of this shaft is worn, and if so we would advise seeing a Maxwell dealer or repairman.

2—We do not like to advise the average car owner to change these gears himself. It is a job for Maxwell. New gears probably are not needed, but adjustment is. Refer to Fig. 2. On either side of the ring gear will be found a notched adjusting collar. This is not shown in the illustration because of the sectional view. Turn the collar on the right side of the gear off a slight amount, and the one on the left on, this will move the whole differential over slightly. In setting these collars be sure to turn an amount that will bring a notch opposite the retaining screw.

Rebuilding

Building Small Car

Q—Give the best way to fix the spindle in the hub of a bicycle wheel.

2—Is it large enough to hold up for a cyclecar?

3—Give diagram of the front axle.

4—How can I repair my 1917 model Country Club Overland so that it will stay in first or second gear?

5—Give instructions to tighten the rear wire wheels of the same car.—Philip Miller, Danville, Ohio.

1—It would be necessary to know what the trouble is before attempting to answer this question. If it is broken the cheapest and best way will be to buy a new one.

2—This will depend upon the weight of the cyclecar, but it would be far safer to use motorcycle wheels, for these will have sufficient strength to withstand the driving and load carrying strains.

3—This is shown in Fig. 10.

4—See answer to Morris Ferguson in this issue.

5—To true up and tighten wire wheels requires some experience and practice and if there is nobody in your locality that can do this work try a bicycle shop, because here they are continually truing up wire wheels. You will require a wrench to fit the nipple or adjusting nut at the rim. It will be necessary to jack up the wheel until it just clears the floor and it will also be necessary to have the adjustment of the wheel bearings reasonably tight. Procure a block of wood and set it so it comes close to the rim. Do not go by the tire; take that off while making the adjustment. Rest a

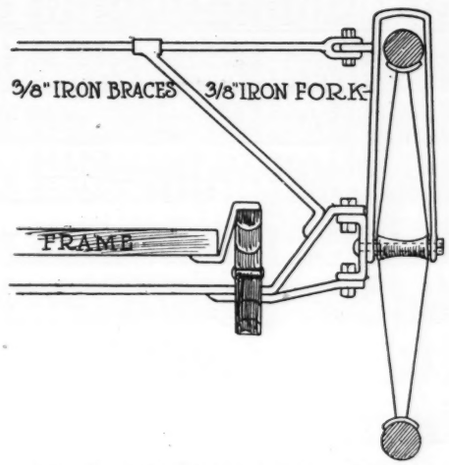


Fig. 10—Suggestion for front axle on cyclecar

piece of chalk on the block of wood, permitting it to just touch the rim. Then whirl the rim slowly. It will be noticed some parts touch the chalk and others do not and this will show the spokes that must be let out a little and those that must be drawn in or tightened at the nipple. This requires very slow work and patience, for otherwise you will get the wheel out of true. It also will be necessary to try the rim for being perfectly round by holding the chalk under the rim and revolving the wheel. Here again the chalk marks will tell that one part is high and another low and that some spokes must be taken up and others let out by turning the nipples.

Bear in mind, however, that when you have trued up the wheel for side wabble, you probably have thrown it out of round. So, as you will see, it is necessary to do all this slowly, having in mind the fact that every time a spoke is loosened or tightened it changes the shape of the rim.

It must not be forgotten that tightening or loosening one spoke will not do; those on either side must be given slightly less adjustment, the second ones away a little less and so on, for just half the spokes carry all the load, with the one directly up bearing the heaviest proportion and this diminishing until those at a horizontal position carry practically none of the load. Of course these positions are constantly changing as the wheel rotates. It will not be necessary to have the spokes too tight; when they are all taut and the rim is true they will be all right.

Remodeling 1915 Buick

Q—Publish suggestion for remodeling a 1915 Buick C-24 roadster. It has a 20-gal. tank and trunk on the rear. We wish to remove this equipment and put on either a steel or wooden deck.—A. A. Davidson, Cohoes, N. Y.

This is shown in Fig. 11.

Remodeling Winton 21

Q—Publish suggestion for remodeling a 1915. model 21, seven-passenger Winton into a five-passenger touring car or a roadster that would be convertable into a five-passenger car. I want to make this car look smaller and to reduce its seating capacity. I want to use the chassis and radiator and possibly the hood, fenders and runningboard as they are. How can the body be lowered with the least expense? Would this be necessary? Can the present body and upholstery, which are in practically new condition, be used economically in making the change?—Richard M. Boren, Philadelphia, Pa.

Changes you want to make and the old material you wish to use do not fit well. First, the body must be lowered. This means the seats must be lowered. The steering wheel must then be accommodated to the new seat height. The back cushion of the front seat probably will need extra padding to make driving comfortable, but the same cushions and upholstering can be used perhaps. The old windshield will need to be changed slightly. The appearance of the car will be greatly improved if the windshied is set at an angle. Our idea of the car with changes is shown in Fig. 12.

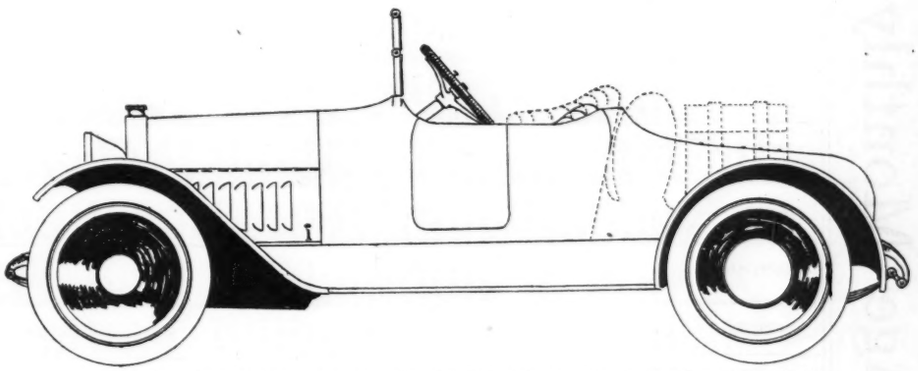


Fig. 11—Suggestion for converting 1915 Buick roadster into car with a deck

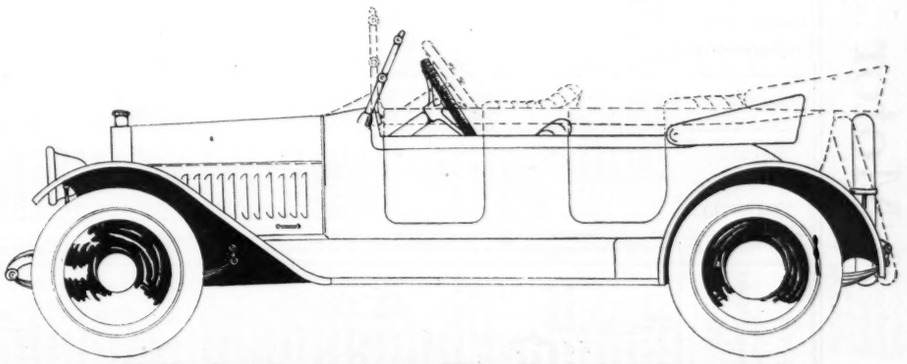


Fig. 12—Suggestion for changing Winton 21 into five-passenger model

Motor Age Monthly Guide to Truck Specifications

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Name of Engine	No. Cyl. Bore and Stroke	Ignition	Electric Lighting	Governor	Carbureter	Clutch	Gearset	Final Drive	Axle	Steering Gear
A. & B., 3T	3	.....	48x3½d	48x3½d	Own	4-5 17x4½	Bosch	none	none	Scheb.	none	Own	in-g.	Own	Gem.
A. & B., 5T	5	.....	48x3½d	48x5d	Own	4-5 17x4½	Bosch	none	none	Scheb.	none	Own	in-g.	Own	Gem.
Acason, H	2	.....	36x4	36x7	Wauk.	4-4½x5½	Eise.	Nlite.	Wauk.	Scheb.	Muncie	Muncie	worm	Timkn.	Ross
Acason, L	3½	.....	36x5	36x5d	Wauk.	4-4½x6½	Eise.	Nlite.	Wauk.	Scheb.	Muncie	Muncie	worm	Timkn.	Ross
Acason, M	5	.....	36x6	40x6d	Wauk.	4-4½x6½	Eise.	none	Wauk.	Scheb.	B.&B.	Cotta	worm	Timkn.	Ross
Acason, R	1	.....	36x3½	36x5	Wauk.	4-3½x5½	Eise.	.....	Wauk.	Scheb.	Muncie	Muncie	worm	Timkn.	Ross
Acason, Tractor	6	.....	36x4	36x7	Wauk	4-4½x5½	Eise.	.....	Wauk.	Scheb.	B.&B.	Cotta	worm	Timkn.	Ross
Acason, Tractor	10	.....	36x5	36x5d	Wauk	4-4½x6½	Eise.	G&D	Duplx.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
Acme, B	1	31,950	34x3½	34x5	Cont.	4-3½x5	Eise.	.....	Duplx.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
Acme, A	2	2,750	36x4	36x7	Cont.	4-4½x5½	Eise.	.....	Duplx.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
Acme, C	3½	3,650	36x5	40x5d	Cont.	4-4½x5½	Eise.	.....	Cont.	Ray.*	B.&B.	Hoosier	B-Lipe	Russel	Lavn.
Acme, E	5	4,750	36x6	40x6d	Cont.	4-4½x6	A-K	Bijur*	Duplx.	Strom.	B.&B.	G-Lees	in-g.	Torbn.	Ross
Air-O-Flex, 188	2	.....	36x4	36x7	H-S	4-4½x5½	Dixie	none	none	Strom.	B.&B.	B-Lipe	B-Lipe	Timkn.	Ross
All American, AA	1	1,295	33x4*	32x4	Buda	4-3½x5	Eise.	West.	Pierce	Scheb.	B-Lipe	B-Lipe	worm	Timkn.	Ross.
American	2	.....	36x4	36x7	Buda	4-4½x5½	Eise.	West.	Pierce	Scheb.	B-Lipe	B-Lipe	worm	Timkn.	Ross
American	3½	.....	36x5	36x5d	Buda	4-4½x6	Eise.	West.	Pierce	Scheb.	B-Lipe	B-Lipe	worm	Timkn.	Ross
American	5	.....	36x6	40x6d	Buda	4-4½x6½	Eise.	none	Pierce	Scheb.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Armleder, HW	2	.....	36x4	36x4d	Cont.	4-4½x5½	Eise.	none	.....	Scheb.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Armleder, KW	3½	.....	36x5	36x5d	Cont.	4-4½x5½	Eise.	Remy	Remy*	Carter	B&B.	B-Lipe	d-rd.	Hess	Gem.
Atlas, 19	½	1,135	32x4*	32x4*	Lyc.	4-3½x5	Eise.	none	none	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Atterbury, 7R	1½	2,575	36x3½	36x5	Cont.	4-4½x5½	Eise.	none	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Atterbury, 7C	2	2,975	36x4	36x4d	Cont.	4-4½x5½	Eise.	none	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Atterbury, 7D	3½	3,875	36x5	40x5d	Cont.	4-4½x6	Eise.	Delco	Cont.	Zenith*	B-Lipe	B-Lipe	worm	Timkn.	Ross
Atterbury, 8E	5	4,975	36x5	40x6d	Cont.	4-4½x6	Eise.	none	none	Strom.	Own	Det.	d-rd.	Own	Own
Autocar, XXI-F	2	2,050	34x4	34x5	Own	2-4½x4½	Bosch	none	opt.	Strom.	B.&B.	B-Lipe	in-g.	Timkn.	Ross
Autohorse, 10	5	2,100	34x10	.....	Cont.	4-3½x5	Koko.	.....	.....	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Available, 1	1	2,250	36x3½	36x5	Cont.	4-3½x5	Bosch	.....	.....	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Available, 2	2	2,950	36x4	36x6	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Available, 3	3½	4,200	36x5	40x5d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Available, 5	5	4,900	36x6	40x6d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Beck, A	1	1,550	34x3	34x4	Cont.	4-3½x5	.....	.....	.....	Strom.	Fuller	Fuller	in-g.	Clark	Lavn.
Beck, B	1½	1,950	34x3½	34x5	Cont.	4-3½x5	Bosch	.....	.....	Strom.	Fuller	Fuller	in-g.	Clark	Lavn.
Beck, C	2	2,250	36x3½	34x6	Cont.	4-	Bosch	.....	.....	Strom.	Fuller	Fuller	in-g.	Clark	Lavn.
Beech Creek, 3A	3	3,850	36x6	36x6	Wauk	4-4½x5½	Eise.	.....	Wauk.	King*	B.&B.	Own	bevel	Own	Own
Bessemer, G	1	1,450	34x3½	34x4	Cont.	4-3½x5	Split.	none	none	Zenith	B.&B.	B-Lipe	in-g.	Torbn.	Ross
Bessemer, H	1½	1,945	36x3½	36x5	Cont.	4-4½x5½	Split.	opt.	opt.	Zenith	B.&B.	B-Lipe	in-g.	Torbn.	Ross
Bessemer, J	2	2,490	36x4	36x4d	Cont.	4-4½x5½	Split.	opt.	opt.	Pierce	B.&B.	B-Lipe	in-g.	Torbn.	Ross
Bessemer, K	3½	3,450	36x5	36x5d	N.A.	4-3½x4½	A-K	G&D*	Mon.	Ray.	B.&B.	B-Lipe	in-g.	Torbn.	Ross
Bethlehem, D	1½	1,965	34x3½	34x5	N.A.	4-4 x4½	A-K	G&D*	Mon.	Scheb.	B.&B.	Det.	in-g.	Russel	Lavn.
Bethlehem, E	2½	2,365	34x4	34x6	N.A.	4-4½x6	A-K	G&D*	Mon.	Scheb.	B.&B.	Det.	in-g.	Russel	Lavn.
Bethlehem, F	3½	3,465	34x4	34x5d	Herc.	4-4 x5½	Eise.	Entz*	Simplx.	Zenith	Entz	Entz	worm	Timkn.	Ross
Bourne, VM	2	3,500	36x4	36x8	Herc.	4-4½x5½	Eise.	Entz*	Simplx.	Zenith	Entz	Entz	worm	Timkn.	Ross
Bourne, XM	3½	4,200	36x5	36x10	Herc.	4-4½x5½	.....	.....	none	.....	.....	.....	worm	.....	.....
Brinton, H	1	1,500	33x4½	33x4½*	Wis.	4-3½x5	Bosch	.....	Pierce	Buick	Own	Own	bevel	Own	Own
Brinton, F	2½	3,000	36x4	36x6	Cont.	4-4½x5½	Conn.	A-I*	none	Buick	Own	Own	in-g.	Russel	Lavn.
Briscoe, 4-24	½	885	31x4*	31x4*	Own	4-3 3/8x5 3/8	Conn.	A-I*	none	Buick	Own	Own	worm	Timkn.	Gem.
Briscoe, T-34	1	.....	33x4*	34x4	Own	4-3½x5	Eise.	none	none	Scheb.	Hart	B-Lipe	worm	Shel.	Gem.
Brockway, J2	1½	2,450	36x3½	36x5	Cont.	4-3½x5	Eise.	.....	Duplx.	Scheb.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Brockway, S	1½	4,850	36x6	40x6d	Cont.	4-4½x5½	Eise.	none	none	Scheb.	Hart	B-Lipe	worm	Timkn.	Gem.
Brockway, K3	2	2,850	36x4	36x7	Cont.	4-4½x5½	Fise.	none	none	Scheb.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Brockway, R	3½	3,750	36x5	36x5d	Cont.	4-4½x5½	Eise.	.....	Duplx.	Car.	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Brockway, T	5	4,850	36x6	40x6d	Cont.	4-4½x6	Eise.	.....	.....	Strom.	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Chase, A	1	1,725	36x3½	36x5	Wauk	4-3½x5½	Bosch	.....	Mon.	Strom.	B.&B.	Cotta	worm	Shel.	Lavn.
Chase, C	1½	2,025	36x3½	36x6	Wauk	4-3½x5½	Bosch	.....	Mon.	Strom.	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Chase, B	2½	2,475	36x4	36x4d	Buda	4-4½x5½	Bosch	.....	Mon.	Strom.	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Chase, X	3	2,800	36x4	36x5d	Buda	4-4½x5½	Bosch	Dneto.*	Mon.	Strom.	B-Lipe	B-Lipe	worm	Salsby.	Lavn.
Chase, O	3½	3,000	36x5	36x5d	Cont.	4-4½x5½	Remy	A-L*	Mon.	Zenith	Own	Warner	worm	Shel.	Warn.
Chevrolet, T	1	.....	31x4*	32x4	Own	4-3½x5½	Lau.	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Clydesdale, 45	1½	.....	36x3½	36x5	Cont.	4-4½x5½	Bosch	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Clydesdale, 65	2	.....	36x4	36x4d	Cont.	4-4½x5½	Bosch	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Clydesdale, 90	3½	.....	36x5	40x5d	Cont.	4-4½x6	Bosch	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Clydesdale, 120B	5	.....	36x5	40x6d	Cont.	4-4½x6	Conn.	A-L*	.....	Zenith	B.&B.	G-Lees	worm	Chgo.	Dtw.
Collier, 16	1½	$1,375	33x4½*	33x4½*	Lyc.	4-3½x5									

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Name of Engine	No. Cyl. Bore and Stroke	Ignition	Electric Lighting	Governor	Carbureter	Clutch	Gearset	Final Drive	Axle	Steering Gear
Gabriel, E	2	3,250	36x4	36x7	Buda	4-4½x5½	Bosch	L-N*	Duplx.	Ray.	B.&B.	B-Lipe	worm	Timkn.	Gem.
Gabriel, F	4	4,300	36x5	40x6d	Buda	4-4½x6	Bosch	L-N*	Duplx.	Ray.	B.&B.	B-Lipe	worm	Timkn.	Gem.
Garford, 75-C	1	2,500	34x4½*	36x4	Buda	4-3½x5½	Split.	West.	Duplx.	Ray.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Garford, 66-B	1½	3,000	36x3½	36x5	Buda	4-4½x5½	Split.	West.	Duplx.	Ray.	B-Lipe	Own	worm	Timkn.	Ross
Garford, 70-B	2	3,300	36x4	36x7	Buda	4-4½x5½	Split.	West.	Duplx.	Ray.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Garford, 77-C	3½	4,300	36x5	40x5d	Wis.	4-4½x5½	Eise.	West.	Duplx.	Ray.	B-Lipe	Own	chain	Own	Ross
Garford, 68	5	5,000	36x6	40x6d	Wis.	4-5 1/16x5½	Eise.	West.	Duplx.	Ray.	B-Lipe	Own	chain	Own	Ross
Garford, 69	6	5,300	36x6	40x7d	Wis.	4-4½x5½	Split.	West.	Duplx.	Ray.	B-Lipe	Own	worm	Timkn.	Ross
Garford Trac, 70-B	4½	3,400	36x4	36x7	Buda	4-4½x5½	Eise.	West.	Duplx.	Ray.	B-Lipe	B-Lipe	chain	Own	Ross
Garford Trac., 77	7	4,400	36x5	40x5d	Wis.	4-5 1/16x5½	Eise.	West.	Duplx.	Ray.	B-Lipe	Fuller	worm	Shel.	Lavn.
Gar. Trac., 68	10	5,100	36x6	40x6d	Wis.	4-5 1/16x5½	Eise.	West.	Duplx.	Ray.	B-Lipe	Fuller	worm	Shel.	Lavn.
Gary, F	1	.....	36x3½	36x4	Cont.	4-3½x5	Eise.	Vesta	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Gary, G	1½	.....	36x3½	36x5	Buda	4-4½x5½	Eise.	Vesta	Simplx	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Gary, H	2	.....	36x4	36x6	Buda	4-4½x5½	Eise.	Vesta	Simplx	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Gary, HU	2½	.....	36x4	36x7	Buda	4-4½x5½	Eise.	Vesta	Duplx.	Strom.	Warner	Warner	worm	W-W.	Fost.
Gary, K	3½	.....	36x5	36x5d	Buda	4-4½x6	Eise.	Vesta	.....	Car.	B.&B.	G-Lees	bevel	Shel.	.....
Gem	½	675	31x4*	31x4*	G.B.S.	4-3½x4½	Conn.	Dneto.*	.....	Scheb.	Warner	.....	chain	Shel.	Jacx.
Geneva, 1	1	1,850	34x3½	34x5	Cont.	2-5½x4½	Simms	.....	.....	Scheb.	Warner	Warner	worm	Timkn.	Jacx.
Giant, 15	1½	2,400	34x3½	34x5	Cont.	4-3½x5	Eise.	Det.	.....	Scheb.	Warner	Warner	worm	Timkn.	Jacx.
Giant, 14	2	2,850	36x4*	36x7*	Cont.	4-4½x5½	Eise.	Det.	.....	Scheb.	Warner	Warner	worm	Timkn.	Ross
Giant, 16	3½	3,850	36x5	36x5d	Cont.	4-4½x5½	Eise.	Det.	.....	Strom.	Warner	Warner	worm	Clark	Lavn.
Giant, 17	5	4,975	36x6	40x6d	Cont.	4-4½x6	Eise.	Det.	Pierce	Mast.	B.&B.	Cover	in-g.	Shel.	Lavn.
Globe, A	1	1,490	34x3½	34x4	Cont.	4-3½x5½	Eise.	.....	Pierce	Mast.	B.&B.	Cover	in-g.	Clark	Lavn.
Globe, B	1½	1,850	36x3½	36x5	Cont.	4-4½x5½	Eise.	.....	Pierce	Mast.	B.&B.	Cover	in-g.	Clark	Lavn.
Globe, C	2	2,190	36x4	36x6	Cont.	4-3½x5	Eise.	.....	Mon.	Own	Own	Own	bevel	Own	Own
Gramm-B., W	½	1,495	35x5*	35x5*	Cont.	4-3½x5	Eise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Lavn.
G. M. C., 16	1	2,025	34x3½	34x5	Cont.	4-3½x5	Eise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Lavn.
G. M. C., 21	1½	2,395	36x3½	36x5	Cont.	4-4½x5½	Eise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Lavn.
G. M. C., 31	2	2,725	36x4	36x4d	Cont.	4-4½x5½	Eise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Lavn.
G. M. C., 41	3½	3,750	36x5	40x5d	Cont.	4-4½x5½	Eise.	.....	Mon.	Marvel	Own	Warner	worm	Clark	Ross
G. M. C., 71	5	4,350	36x6	40x6d	Cont.	4-4½x5	N. E.	.....	none	Strom.	Fuller	Fuller	in-g.	Shel.	Ross
G. M. C., 101	1½	1,895	36x3½	36x5	Cont.	4-3½x5½	Eise.	.....	Wauk.	Zenith	Own	Own	worm	Shel.	Ross
Gramm-B., W	2	2,750	34x4	34x3½d	Wauk	4-4½x5½	Eise.	.....	Wauk.	Zenith	Own	Own	worm	Shel.	Ross
Gramm-B., W	2½	3,350	36x4	36x4d	Wauk	4-4½x5½	Eise.	.....	Wauk.	Zenith	Own	Own	worm	Shel.	Ross
Gramm-B., W	3½	4,000	36x5	40x5d	Wauk	4-4½x5½	Eise.	.....	Wauk.	Zenith	Own	Own	worm	Shel.	Ross
Gramm-B., W	5	5,000	36x6	40x6d	Wauk	4-4½x6½	Dixie	Bijur*	none	Car.*	B.&B.	G-Lees	in-g.	Torbn.	Ditw
Grant, 12	½	1,125	32x4*	32x4*	H-S.	4-3½x5	Dixie	Remy*	Pierce	Car.*	B.&B.	G-Lees	in-g.	Torbn.	Jacx.
Grant, 10	1½	1,885	34x4½	34x5	Cont.	4-3½x5	Dixie	Remy*	Pierce	Car.*	B.&B.	G-Lees	in-g.	Torbn.	Jacx.
Grant, 11	2	1,935	34x4½	34x6	Cont.	4-3½x5	Dixie	Remy*	Pierce	Car.*	B.&B.	G-Lees	in-g.	Torbn.	Jacx.
Grant, 15	2	2,150	34x4	34x6	Cont.	4-3½x5	Dixie	Remy*	Pierce	Car.*	B.&B.	G-Lees	in-g.	Torbn.	Jacx.
Grant, 16	2	2,250	34x4	34x6	Cont.	4-3½x5	Eise.	.....	.....	Strom.	Det.	Det.	in-g.	Torbn.	Lavn.
Hahn, G	1	1,375	34x3	34x4	Cont.	4-3½x5	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Hahn, C	1½	1,950	36x3½	36x5	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Hahn, E	2½	2,500	36x4	36x4d	Cont.	4-4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Hall	2	2,675	36x4	36x4d	Cont.	4-4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Hall	3½	3,500	36x5	36x5d	Cont.	4-4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	chain	Timkn.	Gem.
Hall	5	4,500	36x5	40x6d	Cont.	4-4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Hall	7	4,500	36x5	40xod	Cont.	4-4½x5½	Bosch	none	Mon.	Zenith	Fuller	Fuller	worm	Shel.	Ross
Harvey, WEA	1½	2,250	34x3½	34x5	Buda	4-4½x5½	Eise.	.....	Duplx.	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
Harvey, WFA	2½	3,000	36x4	36x7	Buda	4-4½x6	Eise.	.....	Duplx.	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
Harvey, WHA	3½	3,900	36x5	36x5d	Buda	4-4½x6	Eise.	West.*	Duplx.	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
Harvey WKA	5	5,000	36x6	40x6d	Buda	4-4½x6	Eise.	Vesta	Simplx	Strom.	B.&B.	Fuller	worm	Clark	Gem.
Harvey Trac., HT	10	4,000	36x5	36x5d	Buda	4-4½x6	Eise.	Vesta	Simplx	Zenith	Fuller	Fuller	in-g.	Clark	Gem.
Hawkeye, K	1½	1,900	34x3½	34x5	Buda	4-3½x5½	Eise.	.....	Simplx	Zenith	Fuller	Fuller	in-g.	Timkn.	Ross
Hawkeye, M	2	2,650	36x4	36x6	Buda	4-4½x5½	Dixie	.....	Wauk.	Strom.	Fuller	Fuller	worm	Timkn.	Ross
Hendrickson	2	2,850	36x4	36x4d	Wauk	4-4½x5½	Dixie	.....	Wauk.	Strom.	B.&B.	Cotta.	worm	Shel.	Lavn
Hendrickson	3½	3,600	36x5	36x5d	Wauk	4-4½x5½	Simms	L-N.*	Simplx	Zenith	Fuller	Fuller	worm	Shel.	Lavn
Higrade, A17	1	1,850	35x5*	35x5*	Cont.	4-3½x5	Simms	L-N.*	Simplx	Zenith	Fuller	Fuller	worm	Shel.	Lavn
Higrade, A18	1	2,100	35x5*	35x5*	Cont.	4-3½x5	Split.	none	.....	Scheb.	Fuller	Own	s-bev.	Own	Jacx.
Hoover, 15-B	¾	1,435	32x4*	33x4½*	Cont.	4-3½x5½	A-K.	West.	.....	Strom.	Own	B-Lipe	worm	Own	.....
Hupmobile	2	1,350	33x4*	33x4*	Own	4-4½x5½	Eise.	Vesta	Duplx.	Flech.	B-Lipe	B-Lipe	worm	Own	.....
Hurlburt	3½	3,500	36x4	36x4d	Buda	4-4½x6	Eise.	Vesta	Duplx.	Flech.	B-Lipe	B-Lipe	worm	Own	.....
Hurlburt	4	4,250	36x5	36x5d	Buda	4-4½x6	Eise.	Vesta	Duplx.	Flech.	B-Lipe	B-Lipe	worm	Own	.....
Hurlburt	5	5,250	36x5	40xod	Buda	4-4½x6									

Abbreviations: Engine—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; N.A., North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; GBS, Golden, Belknap & Swartz; Beav., Beaver. **Ignition**—Eise., Eisemann A-K, Atwater Kent; Koko., Kokomo; Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nlite, Nicolite; G&D, Gray & Davie; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West., Westinghouse; L-N, Leece-Neville; Det., Detroit; N-E, North East; Wag., Wagner; Asterisk, electric starting also. **Governor**—Wauk., Waukesha; Duplx., Duplex; Cont., Continental; Mon., Monarch; Simplx., Simplex; McCan., McCanna; Rugles, Ruggles. **Carbureter**—Scheb., Schebler; Strom., Stromberg; Ray., Rayfield; King., Kingston; Mon., Monarch; Shake., Shakespeare; Car., Carter; Flech., Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Borg & Beck; B-Lipe, Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming. **Gearset**—B-Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Savg., Savage Arms. **Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear. **Axle**—Timkn., Timken; Torbn., Torbenson; Key-H, Keystone-Hindley; Shel., Sheldon; Salsby., Salisbury; **Ind.**, Industrial; Chgo., Chicago-Standard; Chgo., Chicago; W-W., Walker-Weiss; **Emp.**, Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Make of Engine	No. Cyl., Bore and Stroke	Ignition	Electric Lighting	Governor	Carbureter	Clutch	Gearset	Final Drive	Axle	Steering Gear
Columbia, F	1	1,750	32x3	32x4	Cont.	4–3½x5	Dixie	.....	Pierce	Shake	B.&B.	Covert	in-g.	Russel	Own
Columbia, E	2	2,350	36x4	36x6	Cont.	4–4½x5½	Split.	Vesta	Pierce	Shake.	Hart	Covert	in-g.	Russel	Own
Columbia, T	6	2,350	36x4	36x6	Cont.	4–4½x5½	Split.	Vesta	Pierce	Shake.	Hart	Covert	in-g.	Russel	Own
Comet	1½	1,750	34x4	34x4	Lyc.	4–3¾x5	Delco	Dneto.	.....	Carter	B.&B.	Muncie	worm	Chego.	CAS.
Commerce, E	1	1,500	34x3	34x4	Cont	4–3½x5	Split.	Bijur*	none	Zenith*	Det.	Det.	in-g.	Torbn.	Jacx.
Commerce, EP	2	1,895	**36x6**	**36x6**	Cont.	4–4½x5	Split.	Bijur*	none	Zenith*	Det.	Det.	in-g.	Russel	Own
Concord, A	1½	2 550	36x3½	36x5	Buda	4–3½x5½	Eise.	.....	Mon.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Concord, B	2½	3,000	36x4	36x4d	Buda	4–4½x5½	Eise.	.....	Mon.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Corbitt, E	1	2,000	34x3½	34x4	Cont.	4–3½x5	Fise.	Disco*	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Corbitt, D	1½	2,400	36x3½	36x5	Cont.	4–3½x5	Fise.	Disco*	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Ross
Corbitt, C	2	3,000	36x4	36x7	Cont.	4–4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B Lipe	worm	Shel.	Ross
Corbitt, B	2½	3,200	36x4	36x7	Cont.	4–4½x5½	Fise.	none	Pier=	Strom.	B-Lipe	B-Lipe	worm	**Shel.**	Ross
Corbitt, A	3½	4,000	36x5	36x5d	Cont.	4–4½x5½	Eise.	none	Pierce	Strom.	H-Shaw	Cotta	worm	Sncl.	Ross
Corbitt, AA	5	4,500	36x6	40x6d	Cont.	4–4½x6	Fise.	none	Pierce	Strom.	H-Snaw	Cotta	worm	Shel.	Ross
Corliss, A	½	800*	31x4*	31x4*	Mil.	4–3¾x4½	Split.	.....	.....	Scheb.	.....	.....	bevel	.....	.....
Couple-Gear, HO	3½	6,000	36x4d	36x4d	Cont.	4–4½x6	Eise.	.....	.....	Strom.	.....	.....	bevel	Own	Own
Couple-Gear, AO	5	6,600	36x5d	36x5d	Wis.	4–5½x7	Fise.	.....	.....	Strom.	.....	.....	bevel	Own	Own
Croce, 17	½	825	32x4*	32x4	Wis.	4–3½x5	Bosch	.....	.....	Zenith	B-Lipe	B-Lipe	bevel	Timkn.	Lavn.
Dart, E	1	2,100	34x3½	34x5	Dart	4–3½x5½	Eise.	Bijur*	none	Zenith*	Fuller	Fuller	worm	Timkn.	Ross
Dart, CC4	2	2,950	36x4	36x7	Buda	4–4½x5½	Eise.	Bijur*	Pierce	Zenith	Fuller	Fuller	worm	Timkn.	Ross
Dart, L	3½	4,000	3ox5	36x10	Buda	4–4½x6	Eise.	Bijur*	Pierce	Zenith	Warner	Warner	worm	Timkn.	Ross
D-E, J	½	1,050	33x4*	33x4*	LeR	4–3¾x4½	Berl.	Al-Ch*	.....	Scheb.	Det.	Det.	worm	Shel.	Gem.
D-E A	1	1,775	34x3	34x4	Cont.	4–3½x5	Berl.	.....	.....	Zenith	B.&B.	Covert	worm	Wis.	Ross
D-E, B	1½	2,075	34x3½	34x5	Cont.	4–3½x5	Berl.	.....	.....	Zenith	B.&B.	Covert	worm	Wis.	Ross
D-E, D	2	2,450	36x4	36x6	Cont.	4–4½x5½	Berl.	.....	.....	Zenith	B.&B.	Covert	worm	Wis.	Ross
D-E, C	2½	2,750	36x4	36x7	Buda	4–4½x5½	Berl.	.....	Mon.	Zenith	B.&B.	Covert	worm	Wis.	Ross
D-E, E	5	4,500	36x5	40x6d	Buda	4–4½x6	Berl.	.....	Mon.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
D-E, F	3½	3 350	36x5	36x5d	Cont.	4–4½x5.	Berl.	.....	Mon.	Zenith	B-Lipe	B-Lipe	worm	Wis.	Ross
Defiance, B	1½	1,795	34x3½	34x5	Cont.	4–3½x5	Eise.	.....	Mon.	Strom.	B.&B	G-Lees	in-g.	Torbn.	Own
Defiance, C	2	1,995	34x3½	34x6	Cont,	4–4½x5	Eise.	.....	Mon.	Strom.	B.&B	G-Lees	in-g.	Torbn.	Own
Defiance, D	3½	3,500	36x5	3ox5d	Cont.	4–4½x5½	Eise.	.....	Mon.	Strom.	B.&B.	Covert	in-g.	Torbn.	Wol.
DeKalb, E-2	2	2,100	34x3½	3ox5	Cont.	4–4½x5½	Eise.	none	none	Master	Fuller	Covert	worm	Timkn.	Ross
DeKalb, E-2½	2½	2,600	3ox4	36x6	Cont.	4–4½x5½	Eise.	none	none	Master	Fuller	Fuller	worm	Timkn.	R ss
Denby, 12	1	1,650	34x3	34x4	Cont.	4–3½x5	Eise.	Bijur*	Mon.	Strom.	Det.	Det.	in-g.	Russel	R ss
Denby, 13	2	2,350	36x3½	36x6	Cont.	4–3½x5	Eise.	Bijur*	Mon.	Strom.	Det.	Det.	in-g.	Russel	Gem
Denby, 25	3	3,000	36x4	36x7	Cont.	4–4½x5½	Eise.	Bijur*	Mon.	Strom.	Fuller	Fuller	in-g.	Russel	Gem
Denby, 27	3½	4,150	36x5	36x10	Cont.	4–4½x5½	Eise.	.....	Duplx.	Strom.	Own	Warner	in-g.	Clark	Ross
Denby, 210	5	4,900	36x6	40x12	Cont.	4–4½x5½	Eise.	.....	Duplx.	Strom.	Own	Warner	in-g.	Clark	Ross
Diamond-T, J5	1	2,125	36x3	36x4	Cont.	4–3½x5	Bosch	none	Pierce	Strom.	B-Lipe	B Lipe	worm	Timkn.	Gem.
Diamond-T, J4	1½	2,550	36x3½	36x5	Cont.	4–3½x5	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Diamond-T, J3	2	2,925	3ox4	36x7	Cont.	4–4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Diamond-T, LB	3½	4,150	36x5	36x5d	Cont.	4–4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Diamond-T, R	5½	4,950	36x6	40x6d	Cont.	4–4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Doane, 1919	6	5.650	36x6	40x6d	Wauk.	4–4½x6½	Bosch	none	Wauk.	Master	B-Lipe	.....	chain	Own	Lavn.
Dorris, K4	2	2,985	36x4	36x7	Own	4–4½x5½	Bosch	West.*	Own	Strom.	Warner	Warner	worm	Timkn.	Ross
Douglas, TA	1	2,000	34x3½	34x5	Buda	4–4½x5	Eise.	A-L	Pierce	Scheb.*	B.&B.	G-Lees	in-g.	Torbn.	Ross
Duplex, E	3½	4,000	3ox6	36x6	Buda	4–4½x5½	Eise.	opt.	Duplx.	Sneb.*	B-Lipe	B-Lipe	in-g.	Own	Lavn.
Ellsworth, 25A	½	855*	30x3½*	30x3½*	Lyc.	4–3½x5	.....	Dneto.*	none	Carter	Mech.	Mech.	bevel	Gemco	Fost.
Fageol	2	3,300	34x4	36x7	Wauk.	4–4 x5½	Dixie	.....	Wauk.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Fargo, P	2	2,200	36x4	36x6	Cont.	4–3½x5	Bosch	none	Mon.	Ray.	Fuller	Fuller	in-g.	Russel	Jacx.
Federal, S	1	1,900	34x3	34x4	Cont.	4–3½x5	Eise.	opt.	Mon.	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal, T	1	2,350	36x3½	36x5	Cont.	4–4½x5½	Eise.	opt.	Mon.	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal, U	2½	2,600	36x4	36x7	Cont.	4–4½x5½	Eise.	opt.	Mon.	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal, Trac	3	2,500	36x3½	36x5	Cont.	4–4½x5½	Eise.	opt.	Mon.	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal, W	3½	3,350	36x5	3ox5d	Cont.	4–4½x5½	Eise.	opt.	Mon.	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal, X	5	4,400	3ox6	40x6d	Cont.	4–4½x5½	Eise.	opt.	Mon.	Zenith	B.&B.	Own	worm	Timkn.	Gem
Federal, Trac	7	3,475	36x5	36x5d	Cont.	4–4½x5½	Eise.	opt.	Mon.	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Forschier	¾	1,535	32x2½	32x3	LeR.	4–3½x4½	Dixie	.....	Mon.	Zenith	Det.	.....	worm	Shel.	Ross
Forschier	1	2,000	34x3	34x4	Cont.	4–3½x5	Bosch	.....	Mon.	Zenith	Fuller	Fuller	worm	Shel.	Ross
Forschler	1½	2,375	34x3½	34x5	Cont.	4–3½x5	Bosch	.....	Mon.	Zenith	Fuller	Fuller	worm	Shel.	Ross
Forschler	2	2,750	34x4	34x6	Contl	4–4½x5½	Bosch	.....	Pierce	Zenith	Fuller	Fuler	worm	Shel.	Ross
Ford, TT	1	550	30x3½*	32x3½	Own	4–3¾x4	Own	.....	.....	Own	Own	Own	worm	Own	Own
F.W.D., B	3	4,600	36x6	36x6	Wis.	4–4½x5½	Eise.	.....	Pierce	Strom.	M&E	Cotta	bevel	Own	Ross
Fulton, FX	1½	1,850	34x3½	34x5	H-S	4–3¾x5½	Simms	.....	Pierce	Carter	B.&B.	Own	in-g.	Russel	Lavn.
Gabriel,* C	1	2,000	35x5*	35x5*	Buda	4–3½x5	Bosch	L-N*	none	Ray.	B.&B.	B-Lipe	worm	Timkn.	Gem.

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Make of Engine	No. Cyl., Bore and Stroke	Ignition	Electric Lighting	Governor	Carbureter	Clutch	Gearset	Final Drive	Axle	Steering Gear
I. H. C., H	¾	1,550	36x3	36x3½	Own	4–3½x5½	Bosch	N-E.*	Own	Holl.	Own	Own	in-g.	Own	Lavn.
I. H. C., F	1	1,850	36x3½	36x4	Own	4–3½x5½	Bosch	N-E.*	Own	Holl.	Own	Own	in-g.	Own	Lavn.
I. H. C., K	1½	2,200	36x3½	36x5	Own	4–3½x5½	Bosch	N-E.*	Own	Holl.	Own	Own	in-g.	Own	Ross
I. H. C., G	2	2,600	36x4	3ox6	Own	4–4 x5	Split.	N-E.*	Own	Ens.*	Own	Own	in-g.	Own	Ross
Independent, F	1	1,485	36x2	36x4	Cont.	4–3½x5	Eise.	Lesco.	Mon.	Marvel	B-Lipe	B-Lipe	worm	Chgo.	Lavn.
Independent, G	2	2,250	36x3½	36x5	Cont.	4–4½x5½	Eise.	none	Mon.	Marvel	.....	.....	worm	.....	.....
Indiana, T	1½	2,150	34x3½	34x4	Wauk.	4–3½x5½	Eise.	West.*	Wauk.	Strom.	B.&B.	Covert	worm	Own	Wol.
Indiana, Q	1½	2,600	36x3½	36x5	Ruten	4–4½x5½	Eise.	West.	Pierce	Strom.	B.&B.	B-Lipe	worm	Shel.	Wol.
Indiana, D	2	2,800	36x4	36x7	Ruten	4–4½x5½	Eise.	West.	Pierce	Strom.	B.&B.	B-Lipe	worm	Shel.	Wol.
Indiana, R	3½	3,450	36x5	36x5d	Ruten	4–4½x5½	Eise.	West.	Pierce	Strom.	B.&B.	B-Lipe	worm	Shel.	Wol.
Indiana, L	5	4,600	36x5	40x6d	Wauk.	4–4½x6½	Eise.	West.	Wauk.	Strom.	B.&B.	B-Lipe	worm	Shel.	Wol.
Jumbo, A	2	2,500	36x4	36x7	Buda	4–4½x5½	Eise.	none	Duplx.	Zenith	Fuller	Fuller	in-g.	Clark	Jacx.
Kearns	¾	850	30x3½*	30x3½*	Lyc.	4–3½x5	Conn.	Dneto.*	none	Carter	Mech.	Mech.	bevel	Peru	Lavn.
Kearns	1½	1,800	34x3½	34x5	H-S.	4–3½x5	Berl.	none	none	.....	B.&B.	G-Lees	.....	Hayes	.....
Kelly-S., K-31	1½	2,750	36x3½	36x6	Own	4–3½x5½	Eise.	opt.*	Own	Zenith	Own	Cover	chain	Own	Gem.
Kelly-S., K-32	1½	2,750	36x3½	36x6	Own	4–3½x5½	Eise.	opt.*	Own	Zenith	Own	Cover	worm	Own	Gem.
Kelly-S., K-35	2½	3,250	36x4	36x4d	Own	4–3½x5½	Eise.	opt.*	Own	Zenith	Own	Cover	chain	Own	Gem.
Kelly-S., K-36	2½	3,250	36x4	36x4d	Own	4–3½x5½	Eise.	opt.*	Own	Zenith	Own	Cover	worm	Own	Gem.
Kelly-S., K-40	3½	4,250	36x5	40x5d	Own	4–4½x6½	Eise.	opt.*	Own	Ray.	Own	Cover	chain	Own	Gem.
Kelly-S., K-45	4	4,400	36x5	40x6d	Own	4–4½x6½	Eise.	opt.*	Own	Ray.	Own	Cover	chain	Own	Gem.
Kelly-S K-50	5	4,900	36x6	40x6d	Own	4–4½x6½	Eise.	opt.*	Own	Ray.	Own	Cover	chain	Own	Gem.
Kelly-S., K-60	6	5,200	36x6	40x7d	Own	4–4½x6½	Eise.	opt.*	Own	Ray.	Own	Cover	chain	Own	Gem.
Kimball, 2A	1½	.....	36x3½	36x5	Wis.	4–4 x5	Eise.	.....	Simplx.	Mast.*	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Kimball, 4A	2	.....	36x4	36x6	Wis.	4–4 x6	Eise.	.....	Simplx.	Mast.*	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Kimball, 6A	2½	.....	36x4	36x7	Wis.	4–4½x6	Eise.	.....	Simplx.	Mast.*	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Kimball, 8A	4	.....	36x5	40x5d	Wis.	4–4½x5½	Eise.	.....	Simplx.	Mast.*	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Kimball, 10A	5	.....	36x6	40x6d	Wis.	4–5 .1x5½	Eise.	.....	Simplx.	Mast.*	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Kissel	1½	2,073	34x3½	34x5	Own	4–3½x5½	Eise.	*	Pierce	Strom.	Warner	Warner	worm	Shel.	Jacx.
Kissel	2	2,832	34x4	36x7	Own	4–4½x5½	Eise.	*	Pierce	Strom.	Warner	Warner	worm	Timkn.	Lavn.
Kissel	3½	3,905	36x5	36x5d	Own	4–4½x5½	Eise.	*	Pierce	Strom.	Warner	Warner	worm	Shel.	Ross
Kissel	5	4,785	36x6	36x6d	Own	4–4½x5½	Eise.	*	Pierce	Strom.	Warner	Warner	worm	Shel.	Ross
Kleiber, AA	1	2,400	34x3½	34x5	Cont.	4–3½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Kleiber, A	1½	2,650	36x3½	36x6	Cont.	4–4½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Shel.	Ross
Kleiber, BB	2	2,950	36x4	36x3½d	Cont.	4–4½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Timkn.	Ross
Kleiber, B	2½	3,500	36x4	36x4d	Cont.	4–4½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Shel.	Ross
Kleiber, C	3½	4,100	36x5	36x5d	Cont.	4–4½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Timkn.	Ross
Kleiber, D	5	5,100	36x6	40x6d	Cont.	4–5½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Timkn.	Ross
Knox, 35	10	5,500	36x4	38x6d	Own	4–5 x5½	Eise.	Bijur.*	none	Zenith*	Own	Own	chain	Timkn.	Ross
Knox, 36	10	6,000	36x4	38x6d	Own	4–5 x5½	Eise.	Bijur.*	none	Zenith*	Own	Own	chain	Timkn.	Ross
Koehler, K	1½	1,450	34x3	34x4	Own	4–3½x5	Eise.	none	Mon.	Strom.	Mech.	Mech.	in-g.	Torbn.	Own
Koehler, L	2½	1,985	34x4	34x6	Own	4–3½x5	Eise.	none	Mon.	Strom.	Mech.	Mech.	in-g.	Torbn.	Own
Koehler, M	2½	2,965	36x4	36x7	Own	4–4x5	Eise.	none	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn	Own
Koehler Trac., KT	3	1,750	34x3	34x5	Own	4–3½x5	Eise.	none	Mon.	Strom.	Mech.	Mech.	in-g.	Torbn.	Own
Koehler, O	3½	3,400	36x5	**36x5d**	Own	4–4½x5	Eise.	none	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Own
Koehler Trac., LT	5	2,165	34x4	34x6	Own	4–3½x5	Eise.	none	Mon.	Strom.	Mech.	Mech.	in-g.	Torbn.	Own
Koehler, R	5	4,200	36x6	36x6	Own	4–5x6	Eise.	none	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Own
LaFrance, 2-A	2	3,350	36x4	36x7	Cont.	4–4½x5½	Conn.	Dneto.*	Simplx	Zenith	B.&B.	B-Lipe	worm	Timkn.	Ross
Lane, G	1½	2,250	34x3½	34x5	Cont.	4–3½x5	Eise.	.....	Pierce	Strom.	Fuller	Fuller	worm	.....	Ross
Lane, H	2½	2,850	34x4	36x6	Cont.	6–3½x5½	Eise.	.....	Pierce	Strom.	B.&B.	Cover	worm	Timkn.	Ross
Lane, K	3½	3,700	36x5	36x5d	Cont.	6–3½x5½	Eise.	.....	Pierce	Strom.	B.&B.	Cover	worm	Shel.	Ross
Lange, B	2	2,950	36x4	36x6	Cont.	4–4½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	Own	chain	Own	Gem.
Lapeer Trac., 3	3	1,650	34x3½	34x5	Wauk.	4–3½x5½	Dixie	.....	Wauk.	Stew.	Fuller	Fuller	in-g.	Torbn.	Ross
Lapeer Trac., 5	5	2,200	34x3½	34x3½d	Wauk.	4–3½x5½	Dixie	.....	Wauk.	Stew.	Fuller	Fuller	in-g.	Torbn.	Ross
Larrabee, M	1	1,950	34x3½	34x5	Cont	4–3½x5	Bosch	.....	Pierce	Scheb.	Fuller	Fuller	worm	Shel.	Lavn.
Larrabee, C-D	2½	3,000	36x4	36x7	Cont.	4–4½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Larrabee, A	3½	3,950	36x5	36x5d	Cont.	4–4½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Larrabee, T	5	4,750	36x5	40x6d	Cont.	4–4½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Lippard-St., C	¾	1,900	35x4½*	35x4½*	Cont.	4–3½x5½	Eise.	Dneto.*	Pierce	Zenith	Hart	B-Lipe	s-bev.	Timkn.	Ross
Lippard-St., H	1	2,250	36x3	36x5	Cont.	4–3½x5½	Eise.	Dneto.*	Pierce	Zenith	Hart	B-Lipe	worm	Timkn.	Ross
Lippard-St., F	1½	2,750	36x3½	36x3d	Cont.	4–4½x5½	Eise.	Dneto.*	Pierce	Zenith	Hart	B-Lipe	worm	Timkn.	Ross
Lippard-St., G	2	3,050	36x4	36x4d	Cont.	4–4½x5½	Eise.	Dneto.*	Pierce	Zenith	Hart	B-Lipe	worm	Timkn.	Ross
Lombard, 5	.....	.....	.....	.....	.....	6–5½x7	.....	.....	.....	Strom.	.....	.....	worm	.....	.....
Loyal	¾	835	32x4*	32x4*	H-S.	4–3½x5	A-K.	*	.....	Strom.	B.&B.	Cover	in-g.	Torbn.	.....
Loyal	¾	950	32x4*	32x4*	H-S.	4–3½x5	A-K.	*	.....	Strom.	B.&B.	Cover	in-g.	Torbn.	.....
Maccar, L	1½	2,750	36x4	36x5	Cont.	4–4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross

Abbreviations: **Engine**—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; N.A., North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; GBS, Golden, Belknap & Swartz; Beav., Beaver. **Ignition**—Eise., Eisemann; A-K, Atwater Kent; Koko., Kokomo; Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nlte, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West., Westinghouse; L-N, Leece-Neville; Det., Detroit; N-E, North East, Wag., Wagner; Asterisk, electric starting also. **Governor**—Wauk., Waukesha; Duplx., Duplex; Cont., Continental; Mon., Monarch; Simplx., Simplex; McCan., McCanna; Rugles, Ruggles. **Carbureter**—Scheb., Schebler; Strom., Stromberg; Ray., Rayfield; King, Kingston; Mon., Monarch; Shake., Shakespeare; Car., Carter; Flech., Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Borg & Beck; B-Lipe, Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming. **Gearset**—B-Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; **Mech.**, Mechanics; Cover., Covert; Savg., Savage Arms. **Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear. **Axle**—Timkn., Timken; Torbn., Torbenson; Key-H, Keystone-Hindley; Shel., Sheldon; Salsby., Salisbury; Ind., Industrial; Chgo., Chicago-Standard; Chgo., Chicago; W-W., Walker-Weiss; Emp., Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.

Motor Age Monthly Motor Truck Specifications—Concluded

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Make of Engine	No. Cyl., Bore and Stroke	Ignition	Electric Lighting	Governor	Carbureter	Clutch	Gearset	Final Drive	Axle	Steering Gear
Maccar, H	2½	3,300	36x4	36x4d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Maccar, M	3½	4,100	36x5	36x5d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Maccar, U	5½	5,000	36x5	40x6d	Wis.	4-5 1x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Mack, AB	1	2,400	36x4	36x3½d	Own	4-4 x5	Split.	opt.	Own	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Mack, AB	1	2,400	36x4	36x3½d	Own	4-4 x5	Split.	opt.	Own	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Mack, AB	1½	2,800	36x4	36x3½d	Own	4-4 x5	Split.	opt.	Own	opt.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Mack, AB	1½	2,800	36x4	36x3½d	Own	4-4 x5	Split.	opt.	Own	Strom.	B-Lipe	B-Lipe	chain	Own	Gem.
Mack, AB	2	3,000	36x4	36x4d	Own	4-4 x5	Split.	opt.	Own	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Mack, AB	2	3,000	36x4	36x4d	Own	4-4 x5	Split.	opt.	Own	Strom.	B-Lipe	B-Lipe	chain	Timkn.	Gem.
Mack, AB	5	.....	36x4	36x4d	Own	4-4 x5	Split.	opt.	Own	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Mack, AC	3½	4,600	36x5	40x5d	Own	4-5 x6	Split.	opt.	Own	Strom.	B-Lipe	B-Lipe	chain	Own	Gem.
Mack, AC	5½	5,250	36x6	40x6d	Own	4-5 x6	Split.	opt.	Own	Strom.	Own	Own	chain	Own	Gem.
Mack Trac., AC	7	4,600	36x5	40x5d	Own	4-5 x6	Split.	opt.	Own	Strom.	Own	Own	chain	Own	Gem.
Mack, AC	7½	5,500	36x7	40x7d	Own	4-5 x6	Split.	opt.	Own	Strom.	Own	Own	chain	Own	Gem.
Mack Trac., AC	11	5,250	36x6	40x6d	Own	4-5 x6	Split.	opt.	Own	Strom.	Own	Own	chain	Own	Gem.
Mack Trac., AC	15	5,500	36x7	40x7d	Own	4-5 x6	Split.	opt.	Own	Strom.	Own	Own	chain	Own	Gem.
Manly, 30	1½	2,050	36x4	36x5	Wauk.	4-3½x5½	Eise.	.....	Wauk.	Zenith*	.....	.....	worm	.....	.....
Manly, 40	2	2,350	36x4	36x6	Wauk.	4-3½x5½	Eise.	.....	Wauk.	Zenith*	.....	.....	worm	.....	.....
Manly, 50	2½	2,800	36x4	40x7	Wauk.	4-4 x5½	Eise.	.....	Wauk.	Zenith*	.....	.....	worm	.....	.....
Master, JI	1½	1,890	34x3½	34x5	Buda	4-4½x5½	Eise.	opt.	McCan.	.....	Fuller	Fuller	in-g.	Torbn.	Wol.
Master, JW	1½	1,890	34x3½	34x5	Buda	4-4½x5½	Eise.	opt.	McCan.	.....	Fuller	Fuller	worm	Timkn.	Wol.
Master, M	2	2,390	34x4	36x7	Buda	4-4½x5½	Eise.	opt.	McCan.	.....	Fuller	Fuller	worm	Timkn.	Wol.
Master, O	2	2,490	34x4	36x7	Buda	4-4½x5½	Eise.	West.	McCan.	Mast.	B-Lipe	B-Lipe	in-g.	Torbn.	Wol.
Master, W	2	2,590	34x4	36x7	Buda	4-4½x5½	Eise.	opt.	McCan.	Mast.	B-Lipe	B-Lipe	in-g.	Torbn.	Wol.
Master, WL	2	2,690	34x4	36x7	Buda	4-4½x5½	Eise.	West.*	McCan.	Mast.	B-Lipe	B-Lipe	in-g.	Torbn.	Wol.
Master, A	3½	3,890	36x5	40x5d	Buda	4-4½x6	Eise.	West.*	McCan.	Mast.	B-Lipe	B-Lipe	worm	Timkn.	Wol.
Master, B	5	4,890	36x6	40x6d	Buda	4-4½x6	Eise.	West.	Pierce	Mast.	B-Lipe	B-Lipe	worm	Timkn.	Wol.
Maxfer	1	1,195	36x4*	34x4	.....	4-3½x5	Eise.	.....	Pierce	Mast.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Maxwell	1	1,085	32x3	32x4	Own	4-3½x4½	Delco	Delco*	.....	.....	.....	.....	worm	Timkn.	Lavn.
Menominee	1	1,890	34x3½	34x5	Cont.	4-3½x5	A-K.	A-L.	Own	John.	Own	Own	worm	Own	Own
Menominee, H	1½	2,475	36x3½	36x5	Cont.	4-3½x5½	Eise.	.....	Mon.	Strom.	Fuller	Fuller	worm	Timkn.	Gem.
Menominee, D	2	2,950	36x4	36x4d	Cont.	4-4½x5½	Eise.	.....	Mon.	.....	Fuller	Fuller	worm	Timkn.	Gem.
Menominee, G	3½	3,880	36x5	36x5d	Cont.	4-4½x5½	Eise.	.....	Mon.	.....	Fuller	Fuller	worm	Timkn.	Gem.
Menominee, J	5	4,950	36x6	40x6d	Cont.	4-4½x5½	Eise.	.....	Mon.	Strom.	Fuller	Fuller	worm	Timkn.	Gem.
Modern, 30	.....	1,800	34x3½	34x5	Cont.	4-3½x5	.....	.....	Mon.	.....	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Moreland, 17-N	1	2,175	34x3½	34x4	Cont.	4-3½x5	.....	.....	opt.	Zenith	Fuller	Fuller	worm	Timkn.	Ross.
Moreland, 17-B	1½	2,930	36x3½	36x5	Cont.	4-4½x5½	Dixie	.....	.....	Miller	Own	Own	worm	Timkn.	Ross.
Moreland, 17-C	2½	3,775	36x4	36x7	Cont.	4-4½x5½	Dixie	.....	.....	Miller	Own	Own	worm	Timkn.	Ross
Moreland, 17-G	4	4,850	36x5	40x5d	Wauk.	4-4½x6½	Dixie	.....	.....	Miller	Own	Own	worm	Timkn.	Ross
Moreland, 17-J	5	5,250	36x6	40x6d	Wauk.	4-4½x6½	Dixie	.....	Wauk.	Miller	Own	Own	worm	Timkn.	Ross
Muskegon, 20	2	2,325	36x4	36x6	Cont.	4-4½x5½	Eise.	none	Pierce	Wauk.	Miller	Own	worm	Timkn.	Ross
Mutual	2	.....	36x4	36x4d	Wis.	4-4½x6	Bosch	Vesta	Duplx.	Stew.	Fuller	Fuller	in-g.	Torbn.	Lavn.
Mutual	3½	.....	36x5	40x5d	Wis.	4-4½x5½	Bosch	Vesta	Duplx.	Strom.	H-Shaw	Fuller	worm	Wis.	Ross
Mutual	5	.....	36x6	40x6d	Wis.	5.1x5½	Bosch	Vesta	Duplx.	Strom.	H-Shaw	Warner	worm	Wis.	Ross
Myers, 50	1	1,495	34x4	34x4	Lyc.	4-3½x5	Delco	Dneto.	Pierce	Car.*	Mech.	Mech.	worm	Emp.	C.A.S
Myers, 55	1	1,460	34x3½	34x4	Lyc.	4-3½x5	Delco	.....	Pierce	Car.*	Mech.	Mech.	worm	Emp.	C.A.S
Myers, 70	1½	1,750	34x3½	34x5	Lyc.	4-3½x5	Delco	Dneto.*	Pierce	Car.*	B.&B.	G-Lees	worm	Emp.	C.A.S
Myers, 75	1½	1,700	34x3½	34x5	Lyc.	4-3½x5	Delco	Dneto.*	Pierce	Car.*	B.&B.	G-Lees	worm	Emp.	C.A.S
Nash, 2018	1	1,650	34x3	34x4	Own	4-3½x5½	Conn.	A-L.*	Duplx.	Strom.	B.&B.	Det.	in-g.	Clark	Jacox.
Nash, 4017	2	3,250	36x5	36x5	Buda	4-4½x5½	Eise.	Bijur*	Duplx.	Strom.	B.&B.	Own	in-g.	Own	Lavn.
Nash, 3018	2	2,175	34x4	36x5	Own	4-3½x5½	Conn.	A-L.*	Duplx.	Strom.	B.&B.	Det.	in-g.	Clark	Jacox.
Nelson & LeM., F	1	2,000	36x3	36x4	Cont.	4-3½x5½	Eise.	West.*	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Nelson & LeM., F2	2	2,775	36x4	36x7	Cont.	4-4½x5½	Eise.	West.*	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Nelson & LeM., F	3½	3,750	36x5	36x5d	Cont.	4-4½x5½	Eise.	West.*	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Nelson & LeM	5	4,750	36x6	40x6d	Buda	4-4½x6	Eise.	West.*	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Netco, D	2	3,000	36x4	36x6	Cont.	4-4½x5½	Eise.	none	.....	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Niles, B	1	1,500	35x5*	35x5*	Cont.	4-3½x5	Eise.	.....	Pierce	Strom.	Cover	Cover	worm	Timkn.	Gem.
Niles, E	2	2,400	36x4	36x7	Cont.	4-4½x5½	Eise.	.....	Pierce	Strom.	B.&B.	Cover	worm	Timkn.	Gem.
Noble, NW2	2½	2,675	36x4	3ox7	Cont.	4-4½x5½	Eise.	Remy.	Pierce	Strom.	B.&B.	Fuller	worm	Shel.	Ross
Noble, NW4	4	3,750	36x5	36x5d	Cont.	4-4½x5½	Eise.	Remy.	Pierce	Strom.	B.&B.	Fuller	worm	Shel.	Ross
Norwalk, 2000	1	.....	34x4*	34x4*	Lyc.	4-3½x5	Delco	Dneto.*	none	Car.*	B.&B.	G-Lees	worm	Emp.	C.A.S
Norwalk, 3000	1½	.....	34x4	34x5	Lyc.	4-3½x5	Delco	Dneto.*	none	Car.*	B.&B.	G-Lees	worm	Stand.	C.A.S
Ogden	1	.....	36x3	36x4	Cont.	4-3½x5	Bosch	.....	Pierce	Ray.	.....	B-Lipe	worm	Timkn	Gem.
O. K., 1½T	1½	2,450	36x4	36x5	Buda	4-4½x5½	Eise.	none	Pierce	Zenith	Muncie	Muncie	worm	Chgo.	Ross

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Make of Engine	No. Cyl., Bore and Stroke	Ignition	Electric Lighting	Governor	Carbureter	Clutch	Gearset	Final Drive	Axle	Steering Gear
Royal	7	6,500	36x7	40x7d	Wis.	4-5½x7	Bosch	opt.*	Mon.	Strom.	H-Shaw	Own	worm	Timkn.	Ross
Rush, D	½	895	31x4	31x4	Cont.	4-3½x5	Conn.	Split.*	.....	Carter	B.&B.	.....	bevel	Own	Lavn.
Sandow, G	1	1,795	34x3	34x5	Cont.	4-3½x5	Eise.	.....	.....	Strom.*	Fuller	Fuller	worm	Shel.	Ross
Sandow, CG	1½	2,090	34x3	34x5	Cont.	4-3½x5	Eise.	.....	.....	Strom.*	Fuller	Fuller	worm	Shel.	Ross
Sandow, H	1½	2,375	34x4	34x6	Cont.	4-3½x5	Eise.	.....	.....	Strom.*	Fuller	Fuler	worm	Timkn.	Ross
Sandow, J	2	2,975	36x4	36x7	Cont.	4-4½x5½	Bosch	.....	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sandow	2	2,650	36x4	36x6	Cont.	4-3½x5	Eise.	.....	.....	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sandow, K	3½	3,995	36x5	36x5d	Cont.	4-4½x5	Bosch	.....	Mon.	Strom.	Fuller	Fuller	worm	Shel.	Ross
Sandow, L	5	4,475	36x6	40x6d	Cont.	4-4½x6	Bosch	.....	Cont.	St.om.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sanford, 25	2½	3,300	36x4	3ox4d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B.&B.	Det.	worm	Shel.	Ross
Sanford, 35	3½	3,975	36x5	36x5d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B.&B.	Warner	worm	Shel.	Ross
Sanford, 50	5	4,750	36x5	36x6d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B.&B.	Warner	worm	Shel.	Ross
Schacht	2	3,150	36x4	36x7	Buda	4-4½x5½	Bosch	none	Duplx.	Scheb.	Hart	Own	worm	Own	Own
Schacht	2½	3,500	36x4	36x4d	Buda	4-4½x5½	Bosch	none	Duplx.	Scheb.	Hart	Own	worm	Own	Own
Schacht	3½	3,950	36x5	36x5d	Buda	4-4½x5½	Bosch	none	Duplx.	Scheb.	Hart	Own	worm	Own	Own
Schacht	5	4,950	36x5	40x6d	Buda	4-4½x5½	Bosch	none	Duplx.	Scheb.	Hart	Own	worm	Own	Own
Schleicher	3	3,675	34x4½	34x3½d	Cont.	4-4½x5½	Bosch	.....	opt.	Strom.	.....	Own	chain	Own	.....
Schleicher	5	4,725	34x5	34x4d	Cont.	4-5 x6	Bosch	.....	.....	Strom.	.....	Own	chain	Own	.....
Selden, TXR	1	2,000	34x3½	34x5	Cont.	4-3½x5	Bosch	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	in-g.	Russel	Lavn.
Selden, TWL	1	2,200	34x3	34x4	Cont.	4-3½x5	Bosch	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Selden, TXL	1	1,650	34x3½	34x5	Cont.	4-3½x5	Bosch	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	in-g.	Russel	Lavn.
Selden, JCB	2	2,850	36x4	36x7	Cont.	4-4½x5½	Bosch	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	in-g.	Russel	Jacx.
Selden, JWB	2	3,050	36x4	36x7	Cont.	4-4½x5½	Bosch	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Jacx.
Selden, NL	3½	3,850	36x5	36x5d	Cont.	4-4½x5½	Eise.	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Jacx.
Selden, DL	5	5,000	36x6	40x12	Cont.	4-4½x5½	Eise.	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Seneca, J	½	.....	30x3½*	30x3½*	LeR.	4-3½x4½	Remy	A-Ch.*	none	Scheb.*	Det.	Det.	bevel	Adams	Ditw.
Service, 320	1	2,100	32x3½	34x5	Buda	4-3½x5½	Eise.	West.	none	Strom.*	Fuller	Fuller	worm	Timkn.	Ross
Service, 340	2	3,000	36x4	3ox7	Buda	4-4½x5½	Eise.	West.	Duplx.	Strom.	B.&B.	B-Lipe	worm	Timkn.	Ross
Service, 370	3½	3,900	36x5	36x5d	Buda	4-4½x5½	Eise.	West.*	Duplx.	Strom.	B.&B.	B-Lipe	worm	Timkn.	Ross
Service, 375	3½	4,200	36x5	36x5d	Buda	4-4½x6	Eise.	West.*	Duplx.	Strom.	B.&B.	B-Lipe	worm	Timkn.	Ross
Service, 400	5	5,000	36x6	40x6d	Buda	4-4½x6	Eise.	West.*	Duplx.	Strom.	B.&B.	B-Lipe	worm	Timkn.	Ross
Shaw, M-3	2	2,700	36x4	36x6	Cont.	4-4½x5½	Bosch	none	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Rosc
Signa, F	1½	2,400	34x3½	36x5	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Signa, H	1½	2,700	34x4	36x6	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Signa, J	2	3,100	34x4	36x8	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Signa, M	3½	4,100	36x5	40x5d	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Signa, R	5	5,100	36x6	40x6d	Cont.	4-4½x6	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Standard, 76	2	2,800	36x4	36x6	Cont.	4-4½x5½	Eise.	none	.....	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Standard, 66	3½	3,675	36x5	36x5d	Cont.	4-4½x5½	Eise.	none	Pierce	Scheb.	B.&B.	B-Lipe	worm	Timkn.	Ross
Standard, 86	5	4,650	36x6	40x6d	Cont.	4-4½x5½	Eise.	none	Mon.	Strom.*	B.&B.	B-Lipe	worm	Timkn.	Gem.
Steele, C	2	2,500	38x5	40x4d	Cont.	4-4½x5½	Eise.	none	Mon.	Strom.*	B.&B.	B-Lipe	worm	Timkn.	Gem.
Steele, B	3	3,000	38x6	40x6d	Own	4-4½x5½	Eise.	.....	Own	Strom.	H-Shaw	Cotta	chain	Own	Ross
Steele, BA	4	3,500	38x6	40x5d	Own	4-5 x5	Eise.	.....	Own	Strom.	H-Shaw	Cotta	chain	Own	Ross
Steele, A	5	4,000	38x7	40x6d	Own	4-5 x5	Eise.	.....	Own	Strom.	H-Shaw	Cotta	chain	Own	Ross
Sterling	2½	3,300	36x4	36x4d	Own	4-5 x5	Eise.	.....	Own	Strom.	H-Shaw	Cotta	chain	Own	Ross
Sterling	3½	4,325	36x5	40x5d	Own	4-4½x5½	Eise.	.....	Wauk.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Sterling	5	5,100	36x6	40x6d	Own	4-4½x6½	Eise.	.....	Wauk.	Ray.*	H-Shaw	Own	worm	Timkn.	Ross
Sterling	7	5,600	36x6	40x7d	Own	4-4½x6½	Eise.	.....	Wauk.	Ray.*	H-Shaw	Own	worm	Timkn.	Ross
Stewart, 6	¾	950	33x4*	33x4*	LeR.	4-3½x4½	Eise.	.....	Le Roi	Zenith	Mech.	Mech.	in-g.	Clark	CAS
Stewart, 8	1	1,575	34x3½	34x4	Cont.	4-3½x5	Eise.	.....	Mon.	Zenith	B.&B.	Fuller	in-g.	Clark	Gem.
Stewart, 9	1½	1,975	34x3½	34x5	Cont.	4-3½x5	Eise.	.....	Mon.	Zenith	Fuller	Fuller	in-g.	Clark	Gem.
Stewart, 7	2	2,575	34x4	34x4d	Cont.	4-4½x5½	Eise.	.....	Pierce	Zenith	Fuller	Fuller	in-g.	Clark	Gem.
Stewart, 10	3½	3,500	36x5	36x5d	Cont.	4-4½x5½	Eise.	.....	Pierce	Zenith	Fuller	Fuller	in-g.	Clark	Ross
Sullivan, F	1½	2,350	36x3	36x5	Buda	4-3½x4½	Bosch	.....	.....	Strom.	Hart	Covert	worm	Timkn.	Ross
Sullivan, E	2	2,850	36x4	36x6	Buda	4-4½x5½	Bosch	.....	Pierce	Strom.*	B-Lipe	B-Lipe	worm	Timkn.	Ross
Superior, A	1	1,600	34x3½	34x4*	Own	4-3½x5	Eise.	none	Mon.	Strom.*	Fuller	Fuller	in-g.	Torbn.	CAS
Superior, C	2	2,200	36x4	36x6	Own	4-3½x5	Eise.	none	Mon.	Strom.*	Fuler	Fuller	in-g.	Torbn.	Ross
Texan	1½	1,375	34x4*	34x4	Lyc.	.....	.....	Dneto.*	.....	.....	.....	Muncie	worm	Chgo.	.....
Tiffin, A	2½	1,100	35x4½	35x4½*	Cont.	4-3½x5	Bosch	none	none	Scheb.	Det.	Det.	in-g.	Russe	Lavn.
Tiffin, GW	1½	2,125	36x3½	36x5	Cont.	4-3½x5½	Bosch	none	Pierce	Scheb.	Fuller	Fuller	worm	Shel.	Ross
Tiffin, MW	2½	2,850	36x4	36x3½d	Cont.	4-4½x5½	Bosch	none	Pierce	Scheb.	Hart	Covert	worm	Timkn.	Ross
Tiffin, PW	3½	3,760	36x5	36x5d	Cont.	4-4½x5½	Bosch	West.*	Pierce	Scheb.	B.&B.	Covert	worm	Shel.	Ross
Tiffin, RW	5	5,000	36x6	40x6d	Cont.	6-3½x5½	Bosch	West.	none	Scheb.	B.&B.	Covert	worm	Shel.	Ross
Tiffin, SW	6	5,200	36x6	40x12	Cont.	6-3½x5½	Bosch	West*	none	Scheb.	B.&B.	Covert	worm	Shel.	Ross

Abbreviations: **Engine**—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; N.A., North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; GBS, Golden, Belknap & Swartz; Beav., Beaver. **Ignition**—Eise., Eisemann; A-K, Atwater Kent; Koko., Kokomo; Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nlite, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West., Westinghouse; L-N, Leece-Neville; Det., Detroit; N-E, North East; Wag., Wagner; Asterisk, electric Starting also. **Governor**—Wauk., Waukesha; Duplx., Duplex; Cont., Continental; Mon., Monarch; Simplx., Simplex; McCan., McCanna; Rugles, Ruggles. **Carbureter**—Scheb., Schebler; Strom., Stromberg; Ray., Rayfield; King., Kingston; Mon., Monarch; Shake., Shakespeare; Car., Carter; Flech., Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Borg & Beck; B-Lipe, Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming. **Gearset**—B-Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Savg., Savage Arms. **Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear. **Axle**—Timkn., Timken; Torbn., Torbenson; Key-H, Keystone-Hindley; Shel., Sheldon; Salsby., Salisbury; Ind., Industrial; Chcgo., Chicago-Standard; Chgo., Chicago; W-W, Walker-Weiss; Emp., Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.

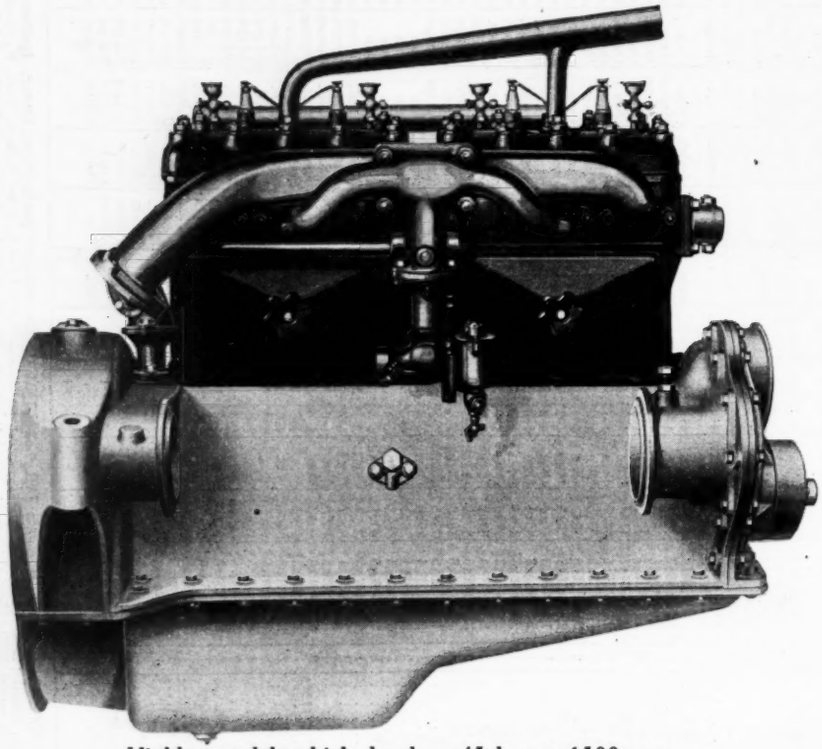
Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Name of Engine	No. Cyl., Bore and Stroke	Ignition	Electric Lighting	Governor	Carbureter	Clutch	Gearset	Final Drive	Axle	Steering Gear
O. K., 2T	2	2,650	36x4	36x5	Buda	4-4½x5½	Eise.	none	Pierce	Zenith	Muncie	Muncie	worm	Chgo.	Ross
O. K., 3T	3	3,250	36x4	36x7	Buda	4-4½x5½	Eise.	none	Pierce	Zenith	Fuller	Fuller	worm	Hays	Ross
Old Hickory, M		995	33x4*	33x4*	Lyc.	4-3½x5	Conn.	Dneto.*	.....	Car.	Lyc.	G-Lees	bevel	Salsby	C.A.S.
Old Rel'ble, W-15	1½	2,350	34x3½	36x6	Wis.	4-4 x5	Bosch	opt.	Mon.	Ray.*	B-Lipe	B-Lipe	worm	Shel.	Ross
Old Rel'ble, W-25	2½	3,250	36x4	36x4d	Wis.	4-4½x6	Bosch	opt.	Mon.	Ray.	Fuller	Fuller	worm	Shel.	Ross
Old Rel'ble, W-35	3½	4,000	36x5	36x5d	Wis.	4-4½x5½	Bosch	opt.	Mon.	Ray.	Univ	Savg	worm	Shel.	Ross
Old Rel'ble, W-50	5	5,000	36x6	40x6d	Wis.	4-5.1x5½	Bosch	opt.	Duplx.	Strom.	Univ.	Savg.	worm	Shel.	Ross
Old Rel'ble, C-50	5	5,000	36x6	36x6d	Wauk.	4-4½x6½	Bosch	none	Wauk.	Strom.	Univ.	Savg.	chain	Shel.	Ross
Old Rel'ble, C-70	7	6,000	36x6	40x7d	Wauk.	4-4½x6½	Bosch	none	Wauk.	Strom.	Univ.	Savg.	chain	Shel.	Ross
Oneida, A	1	2,290	36x3½	36x5	Cont.	4-3½x5½	Bosch	West.	Pierce	Strom.	H-Shaw	Cotta.	worm	Timkn.	Ross
Oneida, B	1½	2,650	36x3½	36x6	Cont.	4-4½x5½	Bosch	West.	Pierce	Strom.	H-Shaw	Cotta.	worm	Timkn.	Ross
Oneida, C	2	3,000	36x4	36x7	Cont.	4-4½x5½	Bosch	West.	Pierce	Strom.	H-Shaw	Cotta.	worm	Timkn.	Ross
Oneida, D	3½	3,700	36x5	36x5d	Cont.	4-4½x5½	Bosch	West.	Pierce	Strom.	H-Shaw	Cotta.	worm	Timkn.	Ross
Oneida, E	5	4,750	36x6	40x12	Cont.	4-5½x5½	Bosch	West.	Pierce	Strom.	H-Shaw	Cotta.	worm	Timkn.	Ross
Overland, Panel		900	31x4*	31x4*	Own	4-3½x5	Conn.	A-L.*	.....	Till.*	Own	Own	bevel	Own	Own
Overland, Exp		900	31x4*	31x4*	Own	4-3½x5	Conn.	A-L,*	.....	Till.*	Own	Own	bevel	Own	Own
Overland		1,015	33x4½*	33x4½*	Own	4-4½x4½	Conn.	A-L.*	.....	Till.	Own	Own	s-bev.	Own	Own
Packard, E	1½	3,000	34x3½	34x3½d	Own	4-4 x5½	Split.	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E	2	3,400	34x4	34x4d	Own	4-4 x5½	Split.	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E	3	4,100	36x5	36x5d	Own	4-4½x5½	Split.	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E	4	4,450	35x5	40x5d	Own	4-4½x5½	Split.	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E	5	5,150	36x6	40x6d	Own	4-5 x5½	Split.	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E	6	5,400	36x6	40x7d	Own	4-5 x5½	Split.	Bijur*	Own	Own	Own	Own	worm	Own	Own
Palmer	1	1,585	34x3½	34x4	Cont.	4-3½x5	Bosch	.....	Pierce	Strom.	Fuller	Fuller	in-g.	Torbn.	Ross
Palmer	2	2,275	36x3½	36x4d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	Fuller	Fuller	worm	Timkn.	Ross
Panhard, A	1	1,195	32x3½	32x3½	Gray	4-3½x5	A-L	A-L	.....	Strom.*	Fuller	Fuller	in-g.	Torbn.	Lavn.
Panhard, B	1½	1,395	32x3½	32x4	Gray	4-3½x5	A-L	A-L	.....	Strom.*	Fuller	Fuller	in-g.	Torbn.	Lavn.
Panhard, E	2½	2,350	34x4	34x6	Buda	4-4½x5½	Eise.	opt.	Duplx.	Strom.	Fuller	Fuller	in-g.	Torbn	Lavn.
Parker	2	3,150	34x4	36x3½d	Cont.	0-3½x5½	Dixie	West.*	Pierce	Strom.	B-Lipe	Own	worm	Own	Ross
Parker	3	3,700	34x4	36x5d	Cont.	6-3½x5½	Dixie	West.*	Pierce	Strom.	B-Lipe	Own	worm	Own	Ross
Parker	4	4,250	36x5	...5d	Cont.	6-3½x5½	Dixie	West.*	Pierce	Strom.	B-Lipe	Own	worm	Own	Ross
Parker	5	5,000	36x5	40x6d	Cont.	6-3½x5½	Dixie	West.*	Pierce	Strom.	B-Lipe	Own	worm	Own	Ross
Patriot	1½	2,150	34x3½	34x5	Cont.	4-3½x5	.....	.....	.....	Pierce	Strom.*	.....	.....	.....	.....
Patriot	2½	3,150	34x4	34x7	Cont.	4-4½x5½	.....	.....	.....	Pierce	Strom.*	.....	.....	.....	.....
Peerless, TC	3	4,125	36x4	40x4d	Own	4-4½x6½	Remy	none	Own	Strom.	Own	Own	chain	Own	Own
Peerless, TC	4	4,150	36x5	40x5d	Own	4-4½x6½	Remy	none	Own	Strom.	Own	Own	chain	Own	Own
Peerless, TC	5	4,700	36x6	40x6d	Own	4-4½x6½	Remy	none	Own	Strom.	Own	Own	chain	Own	Own
Pierce-Ar., X-4	2	3,750	36x4	36x4d	Own	4-4 x5½	Eise.	West.*	Own	Own	Own	Own	worm	Own	Own
Pierce-Ar., R-9	5	5,500	36x6	40x6d	Own	4-4½x6	Eise.	West.*	Own	Own	Own	Own	worm	Own	Own
Power	2	.....	36x4*	36x4d*	Cont.	4-4½x5½	Simms	.....	Pierce	King	Fuller	Fuller	worm	Timkn.	Ross
Rainier, R-5	¾	1,550	34x4	34x4	Cont.	3-4½x5½	Simms	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Rainier, R-5	¾	1,250	33x4*	33x4*	Lgt.	4-3½x4½	Simms	none	none	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Rainier, R-2	¾	1,350	34x4*	34x4*	Lgt.	4-3½x4½	Simms	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Rainier, R-4	1½	1,595	33x4*	34x4	Lgt.	4-3½x4½	Simms	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Hayes	Lavn.
Rainier, R-6	1½	1,890	34x3	34x4	Cont.	4-3½x5½	Simms	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Chgo.	Lavn.
Rainier, R-8	2	2,250	34x4	34x6	Cont.	4-3½x5½	Simms	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Chgo.	Lavn.
Ren.-Leslie, M	2½	2,895	36x5	36x7	Buda	4-4½x5½	Split.	West.	Pierce	Strom.	Warner	Warner	worm	Hayes	Lavn.
Ren.-Les'ie, B	8	2,895	36x5	36x7	Buda	4-4½x5½	Split.	West.	Pierce	Strom.	Warner	Warner	worm	Hayes	Lavn.
Reo, F	3	1,250	34x4½*	34x4½*	Own	4-4½x4½	Remy	Remy*	none	John.	Own	Own	s-bev.	Own	Own
Republic, Desp	¾	1,095	32x3	32x3½	Own	4-3½x5	Remy	Remy	Rugles	Strom.	Own	Own	in-g.	Torbn.	Jacx.
Republic, 9 Sp	¾	1,295	32x3	32x4	Own	4-3½x5	Eise.	none	Rugles	Strom.	Own	Own	in-g.	Torbn.	Jacx.
Republic, 10	1	1,535	34x3	34x4	Cont.	4-3½x5	Eise.	none	Rugles	Strom.	Fuller	Fuller	in-g.	Torbn.	Jacx.
Republic, 11X	1½	1,885	34x3½	34x5	Cont.	4-3½x5	Eise.	none	Rugles	Strom.	Fuller	Fuller	in-g.	Torbn.	Jacx.
Republic, 19	2	2,395	34x4	34x6	Cont.	4-4½x5½	Bosch	none	Pharo	Strom.	Fuller	Fuller	in-g.	Torbn.	Jacx.
Republic, 20	3½	3,450	36x5	36x5d	Cont.	4-4½x5½	Bosch	none	Pharo	Strom.	Fuller	Fuller	in-g.	Torbn.	Jacx.
Riker, B	3	.....	36x5	36x5	Own	4-4½x6	Berl.	West.*	Own	Own	Own	Own	worm	Own	Ross
Riker, BB	4	.....	36x5	36x6d	Own	4-4½x6	Berl.	West.*	Own	Own	Own	Own	worm	Own	Ross
Rowe, CDW	2	3,000	34x4	36x7	Wis.	4-4 x5	Bosch	none	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Rowe, CDW	2½	3,250	34x4	36x4d	Wis.	4-4 x5	Bosch	none	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, DEW	3	3,800	36x5	36x5d	.....	4-4 x6	Bosch	none	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, GW	3	.....	38x7	42x9	H-S	.....	.....	A-K	West.*	.....	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, FW	5	4,900	36x6	40x6d	Wis.	4-4½x5½	Bosch	.....	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Royal	1	2,400	34x4	34x5	Wis.	4-3½x5	Bosch	opt.*	Mon.	Strom.	B.&B.	Own	worm	Timkn.	Ross
Royal	2	2,800	34x4	34x5	Wis.	4-3½x5	Bosch	opt.*	Mon.	Strom.	B.&B.	Own	worm	Timkn.	Ross
Royal	2	3,200	36x4½	36x6	Wis.	4-4 x6	Bosch	opt.*	Mon.	Strom.	B.&B.	Own	worm	Timkn.	Ross
Royal	2½	3,500	36x4½	36x6	Wis.	4-4½x6	Bosch	opt.*	Mon.	Strom.	B.&B.	Own	worm	Timkn.	Ross
Royal	3½	4,200	36x5	38x5d	Wis.	4-4½x6	Bosch	opt.*	Mon.	Strom.	B.&B.	Own	worm	Timkn.	Ross
Royal	5	5,000	36x6	40x6d	Wis.	4-4½x5½	Bosch	opt.*	Mon.	Strom.	H-Shaw	Own	worm	Timkn.	Ross
Royal	6	5,400	36x6	40x6d	Wis.	4-5¼x6	Bosch	opt.*	Mon.	Strom.	H-Shaw	Own	worm	Timkn.	Ross

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Make of Engine	No. Cyl., Bore and Stroke	Ignition	Electric Lighting	Governor	Carbureter	Clutch	Gearset	Final Drive	Axle	Steering Gear
Titan, T	3½	4,300	36x5	40x5d	Buda	4-4½x6	Bosch	Bosch	Duplx.	Strom.	B.&B.	Cotta	in-g.	Clark	Lavn.
Titan, H	6	5,150	36x6	40x6d	Buda	4-4½x6	Bosch	Bosch	Duplx.	Strom.	B.&B.	Cotta	in-g.	Clark	Lavn.
Tower, F	2	2,975	36x4	36x7	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	Fuller	Fuller	worm	Timkn.	Ross
Tower, G	3½	4,100	3ox5	36x5d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	Fuller	Fuller	worm	Timkn.	Ross
Traffic	2	1.395	34x3	34x4	Gray	4-3½x5	Koko.	none	none	Carter	B.&B.	Cover.	in-g.	Russe.	Ditw.
Transport, N	5	2,750	34x3½	34x4d	.....	4-3½x5	Bosch	.....	Mon.	Zenith	.....	.....	worm	.....	.....
Triangle, A	1½	2,185	34x3½	34x6	Wauk.	4-3½x5½	Eise.	none	Wauk.	Strom.	Fuller	Fuller	in-g.	Clark	Gem.
Triangle, B	2½	2,850	36x4	36x7	Ruten	4-4½x5½	Eise.	.....	Pierce	Strom.	Fuller	Fuller	in-g.	Clark	Gem
Union, B	2½	2,375	36x4	36x7	Cont.	4-4½x5½	Eise.	none	Duplx.	Scheb.	Fuller	Fuller	in-g.	Russel	Ross
Union, C	4	3,500	36x6	36x5d	Wis.	4-4½x6	Eise.	.....	.....	Scheb.	.....	Fuller	in-g.	Torbn.	.....
U. S., E	2½	2,800	34x4	36x4d	Cont.	4-4½x5½	Eise.	.....	Pierce	Strom.	Hart	Cotta	chain	Own	Lavn.
U. S., H	2½	3,250	34x4	36x4d	Cont.	4-4½x5½	Eise.	.....	Pierce	Strom.	Hart	B-Lipe	worm	Shel.	Lavn.
U. S., D	3½	3,500	3ox5	36x5d	Cont.	4-	Eise.	.....	Pierce	Strom.	Hart	B-Lipe	chain	Own	Lavn.
U. S., J	3½	3,950	36x5	40x5d	Cont.	4-4½x5½	Eise.	.....	.....	Strom.	Hart	B-Lipe	worm	Shel.	Lavn.
U. S., K	5	4,850	36x5	40x6d	Wauk.	4-4½x6½	Eise.	.....	Wauk.	Strom.	B.&B.	B-Lipe	worm	Shel.	Lavn.
United, AX	1½	.....	36x3½	36x6	Buda	4-3½x5½	Eise.	opt.	Simplx*	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
United, BX	2½	.....	36x4	36x7	Buda	4-4½x5½	Eise.	.....	Simplx*	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
United, CX	3½	.....	36x5	36x5d	Buda	4-4½x6	Eise.	.....	Simplx*	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
United, VX	5	.....	36x5	40x6d	Buda	4-4½x6	Eise.	.....	Simplx*	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Universal, G	1½	.....	34x3½	34x5	Buda	4-3½x5½	Eise.	.....	Mon.	Zenith	Own	Own	worm	Own	Lavn.
Universal, D	2	.....	36x5	36x4d	Own	4-4½x5½	Eise.	.....	Mon.	Zenith	Own	Own	chain	Own	Lavn.
Universal, L	3½	.....	36x5	36x5d	Buda	4-4½x5½	Eise.	.....	Mon.	Zenith	Own	Own	chain	Own	Lavn.
Velie, 25B	2	2,950	36x4	36x7	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.*	B.&B.	B-Lipe	worm	Timkn.	Gem.
Velie, 26B	3½	3,900	36x5	36x5d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B.&B,	B-Lipe	worm	Timkn.	Gem.
Vim, 21	½	945	31x4*	31x4*	Own	4-3 x4½	Split.	West.	.....	Zenith	Own	Own	bevel	.....	Jacx.
Vim, 25	1	2,195	34x3½	34x4	Herc.	4-3½x5½	Split.	.....	Duplx.	Zenith	.....	.....	worm	Shel.	Gem.
Vim, 22	2	3,150	36x4	36x6	Herc.	4-3½x5½	Split.	.....	Duplx.	Zenith	.....	B-Lipe	worm	Shel.	Gem.
Vim, 23	3	3,950	36x4	36x4d	Herc.	4-4½x5½	Split.	.....	Duplx.	Zenith	.....	B-Lipe	worm	She..	Gem.
Walter, MO	3	.....	40x4d	40x4d	Own	4-4½x6	.....	none	Own	Zenith	Own	Own	ext-g.	Own	Own
Walter, F	5	5,700	40x7	40x10	Own	4-4½x6½	Eise.	West.*	Own	H&N	Warner	Own	in-g.	Own	Own
Watson, Tractor	5	4,050	34x4	36x5d	Cont.	4-4½x5½	Bosch	none	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Weir-Smith	3½	.....	37x7	37x7	Cont.	4-4½x5½	Dixie	.....	.....	Zenith	Fuller	Own	worm	Timkn.	Ross
White, GBBE	¾	2,300	34x4½*	34x4½*	Own	4-3½x5½	.....	.....	.....	.....	.....	Own	bevel	Own	Own
White, TBC	1½	3,300	36x4	36x7	Own	4-3½x5½	.....	.....	.....	none	Own	Own	Own	d-rd.	Own	Own
White, TJ	3	4,100	36x5	40x5d	Own	4-3½x5½	.....	.....	.....	none	Own*	Own	Own	d-rd.	Own	Own
White, TG	5	5,000	36x6	40x6d	Own	4-4½x5½	.....	.....	.....	none	Own*	Own	Own	d-rd.	Own	Own
White-Hi., H	1½	2,400	36x3½	36x5	Cont.	4-3½x5	Eise.	none	Pierce	Strom.*	Fuller	Fuller	worm	Timkn.	Ross
Wichita, A	1	1,850	36x3	36x4	Own	4-3½x5	Bosch	Bosch	none	Strom.	Own	Cover.	chain	Shel.	Ross
Wichita, K	1	2,000	36x3	36x4	Own	4-3½x5	Bosch	Bosch	none	Strom.	Own	Cover.	worm	Shel.	Ross
Wichita, L	1½	2,350	36x3½	36x5	Own	4-3½x5	Bosch	Bosch	none	Strom.	Own	Cover.	worm	Shel.	Ross
Wichita, B	2	2,500	36x3½	36x6	Own	4-3½x5	Bosch	Bosch	none	Strom.	Own	Cover.	chain	Shel.	Ross
Wichita, R	2½	2,950	36x4	36x7	Wauk.	4-3½x5½	Bosch	Bosch	Wauk.	Strom.	Hart.	B-Lipe	worm	Shel.	Ross
Wichita, O	3½	3,750	36x5	36x5d	Wauk.	4-4½x5½	Bosch	Bosch	Wauk.	Strom.	Harr,	B-Lipe	worm	Shel.	Ross
Wichita, Q	5	4,600	38x6	38x6d	Wauk.	4-4½x5½	Bosch	Bosch	Wauk.	Strom.	Hart.	B-Lipe	worm	Shel.	Ross
Wilcox, S	1½	1,950	35x5*	35x5	Cont.	4-3½x5	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Shel.	Own
Wilcox, X	1½	2,775	36x4	36x5	Own	4-4½x5	Bosch	none	Pierce	Strom.	Own	Own	worm	Shel.	Own
Wilcox, Q	2½	3,250	36x4	36x3½d	Own	4-4½x5	Bosch	none	Pierce	Strom.	Own	Own	worm	Shel.	Own
Wilcox, P	3½	3,950	36x5	36x5d	Own	4-4½x5	Bosch	.....	Pierce	Strom.	Own	Own	worm	Shel.	Own
Wilcox, W	5	4,850	36x5	40x12	Wauk.	4-4½x6½	Bosch	none	Wauk.	Strom.	Own	Own	worm	Shel.	Own
Wilson	1	1,750	35x5*	35x5	Cont.	4 3½x5	Eise.	opt.	Pierce	Strom.	B.&B.	Covert	worm	Timkn.	Own
Wilson	2	2,800	36x4	36x7	Cont.	4 4½x5½	Eise.	opt.	Pierce	Marvel	Hart.	Covert	worm	Timkn.	Own
Wilson	3½	3,800	36x5	36x5d	Cont.	4-4½x5½	Eise.	opt.	Mon.	Strom.	B.&B.	Warner	worm	Timkn.	Own
Wilson	5	4,600	36x6	40x6d	Cont.	4-4½x5½	Eise.	opt.	Mon.	Strom.	B.&B.	Warner	worm	Timkn.	Ross
Winther, 19	1	2,150	34x3½	34x5	Wis.	4-3½x5	Eise.	Bijur*	Simplx.	Strom.	Fuller	Fuller	in-g.	Clark	Lavn.
Winther, 49	2	3,000	36x4	36x4d	Wis.	4-4 x6	Eise.	Bijur*	Simplx.	Mast.*	B.&B.	B-Lipe	in-g.	Clark	Ross
Winther, 69	3	3,800	36x5	36x5d	Wis.	4-4 x6	Eise.	Bijur*	Simplx.	Mast.*	B.&B.	B-Lipe	in-g.	Clark	Ross
Winther, 89	4	4,200	36x5	40x5d	Wis.	4-4½x6	Eise.	Bijur*	Simplx.	Mast.*	B.&B.	B-Lipe	in-g.	Clark	Ross
Winther, 109	5	5,000	36x6	40x6d	Wis.	4-4½x5½	Eise.	Bijur*	Simplx.	Mast.*	B.&B.	B-Lipe	in-g.	Clark	Ross
Winther, 129	6	5,250	36x6	40x12	Wis.	4-5½x6	Eise.	Bijur*	Simplx.	Mast.*	B.&B.	B-Lipe	in-g.	Clark	Ross
Winther, 149	7	5,500	36x6	40x7d	Wis.	4-5½x6	Eise.	Bijur	Simplx.	Mast.*	B.&B.	B-Lipe	in-g.	Clark	Ross
Winther, 439	1½	2,100	32x4	32x4	Gray	4-3½x5	Eise.	.....	.....	Strom.	Fuller	Fuller	in-g.	Clark	Lavn.
Winther, 499	3½	4,900	36x5	36x5d	Wis.	4-4½x6	Eise.	Bijur	.....	Mast.	B.&B.	B-Lipe	in-g.	Clark	Ross
Wisconsin, B	1½	1,750	34x3½	34x4	Wauk.	4-3½x5½	Eise.	none	Wauk.	Mast.	Fuller	Fuller	worm	Shel.	Lavn.
Wisconsin, C	2½	2,850	36x4	36x6	Wauk.	4-4 x5½	Eise.	none	Wauk.	Mast.	Fuller	Fuller	worm	Shel.	Lavn.
Witt-Will, WD-16	1	1,850	36x3*	36x4*	Cont.	4-3½x5½	Eise.	.....	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Witt-Will, WD-18	2½	2,850	36x3½*	36x3½d	Cont.	4-4½x5½	Eise.	.....	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Wolverine, C	1½	2,250	34x3½	34x5	Cont.	4-3½x5	Split.	G&D*	Mon.	Strom.	Fuller	Fuller	in-g.	Russel	Gem.

Abbreviations: **Engine**—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; **N.A.**, North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; GBS, Golden, Belknap & Swartz; Beav., Beaver. **Ignition**—Eise., Eisemann; A-K, Atwater Kent; Koko., Kokomo; Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nlite, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West., Westinghouse; L-N, Leece-Neville; Det., Detroit; N-E, North East; Wag., Wagner; Asterisk, electric starting also. **Governor**—Wauk., Waukesha; Duplx., Duplex; Cont., Continental; Mon., Monarch; Simplx., Simplex; McCan., McCanna; Rugles, Ruggles. **Carbureter**—Scheb., Schebler; Strom., Stromberg; Ray., Rayfeld; King., Kingston; Mon., Monarch; Shake., Shakespeare; Car., Carter; Flech., Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Borg & Beck; B-Lipe, Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming. **Gearset**—B-Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Savg., Savage Arms. **Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear. **Axle**—Timkn., Timken; Torbn., Torbenson; Key-H, Keystone-Hindley; Shel., Sheldon; Salsby., Salisbury; Ind., Industrial; Chcgo., Chicago-Standard; Chgo., Chicago; W-W., Walker-Weiss; Emp., Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.

Hinkley Adapts B Engine for Heavy Duty

Three Models for Trucks and Tractors



Hinkley model, which develops 45 hp. at 1500 r. p. m.

THE Hinkley Motors Corp., Detroit, is entering commercial production with a line of truck and tractor engines built around the standards of design and workmanship utilized in the manufacture of the class B Government engine to be known as the Hinkley class B, and models HA and HAA, which are less massive. The three engines have similar characteristics, are rated at 55 hp. at 1400 r.p.m. for the class B, 45 hp. at 1500 r.p.m. for the HA, and 35 hp. at 2000 r.p.m. for the HAA. These engines are respectively suitable for 4 to 6-ton, 3 to 4-ton, and 1½ to 2½-ton commercial vehicles, or four-plow, two to three-plow, and one to two-plow farm tractors.

The class B military engine has been described frequently. The Hinkley class B is similar in practically all respects, the only change being in manufacturing detail. The class B is 4¾ by 6-in. with cylinders block cast. The weight is 1040 lb., less carbureter and magneto.

A Second Model

Model HA is 4½ by 5½ in. and is produced identical in appearance, quality and workmanship, with the same rigid inspection safeguards as class B. Model HAA is 3¾ by 5¼ in. and is also adapted for 4-in. bore cylinders for use with maximum 2½-ton truck sizes, enabling truck manufacturers to standardize on one engine that will take care of trucks ranging from 1½ to 2½ tons.

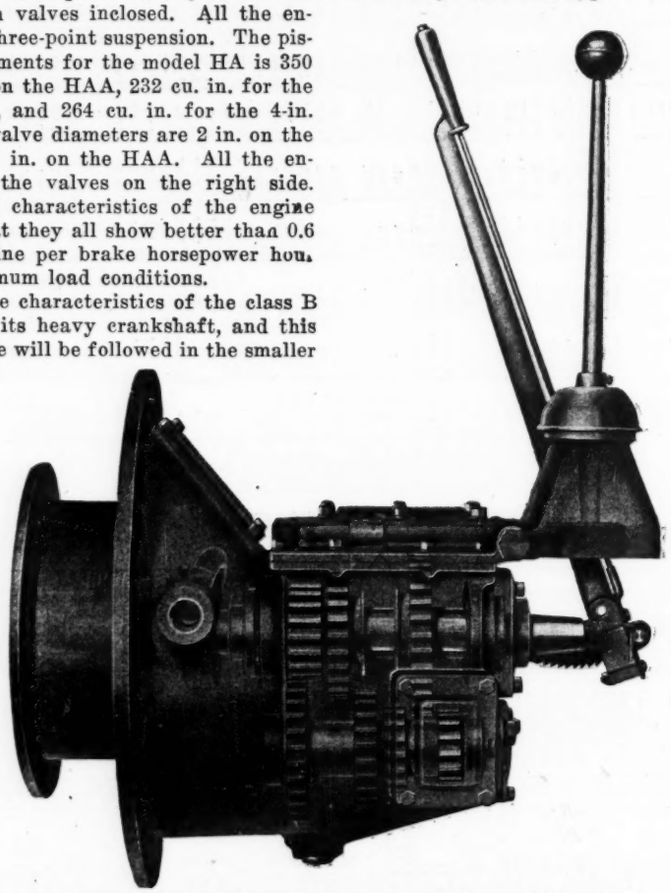
These three engines give a line which will incorporate all sizes necessary for trucks from 1½ to 6 tons capacity. The general description and specifications of these three engines are similar. The cylinders have two detachable heads with cast-iron crankcase and pressed steel pan. The cylinders are L-head, with valves inclosed. All the engines have three-point suspension. The piston displacements for the model HA is 350 cu. in. and on the HAA, 232 cu. in. for the 3¾-in. bore, and 264 cu. in. for the 4-in. bore. The valve diameters are 2 in. on the HA and 1¾ in. on the HAA. All the engines have the valves on the right side. The general characteristics of the engine are such that they all show better than 0.6 lb. of gasoline per brake horsepower hour under maximum load conditions.

One of the characteristics of the class B engine was its heavy crankshaft, and this same feature will be followed in the smaller models. The camshafts are carried on three large collar bearings through which the camshaft may be withdrawn, leaving the bearings integral with the case. The cams are designed for the roller type of lifter and these are large to withstand wear. The large valve stems and heavy spring characteristics of the class B military engine are followed on these two smaller models and the same locking systems on the valve stems are utilized. Provision is made on the engine for lighting generator and starting motor, the make of which is optional with the purchaser.

Hot-Spot Manifold

Pump water circulation is used, a centrifugal pump with one connection to the cylinder being employed. To assist in vaporizing the fuel the engines have a hot-spot manifold.

A full force-feed lubricating system is employed with the oil pump submerged in the oil pan, the latter being integral with the crankcase so the crankcase can be dropped without disturbing the pump. The oiling system is so arranged that the lubricant feeds through a complete copper tubing system, clipped to the inside of the crankcase and carrying the maximum oil pressure to all the needed points. To maintain constant pressure, there is an automatic regulating relief valve. The oil gage is on the side of the crankcase and is of the conventional bayonet blade type.



National transmission for cars and light trucks

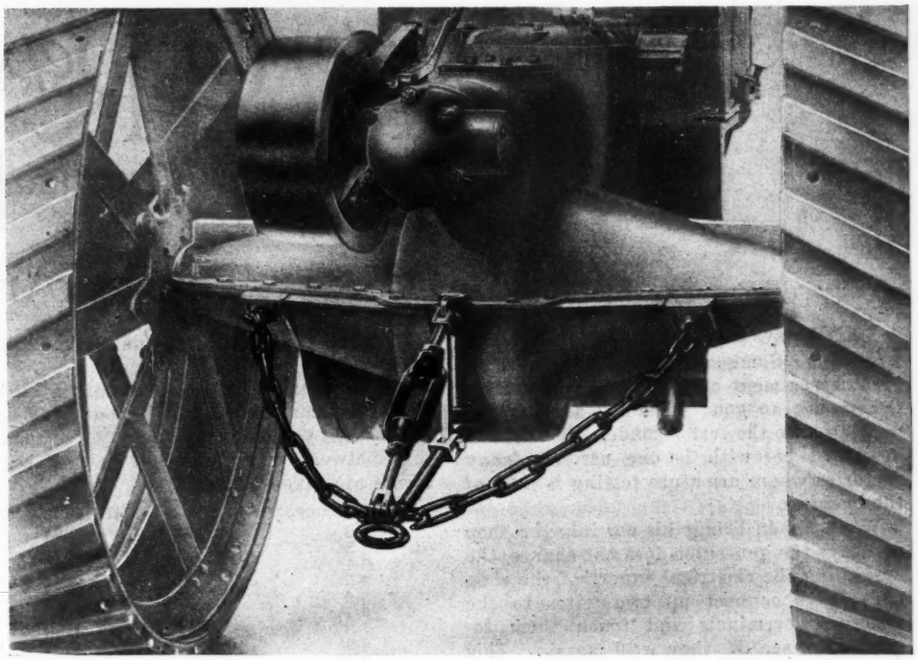
Throughout the construction, sections are generous wherever there is any unusual stress. This is particularly noticeable in the pistons, which are extra heavy in section to enable the heat to be rapidly carried to the jacket wall with the greatest amount of speed to insure cool heads. Another provision for safety is in the extra large anchorage plate on the front of the cylinder block to take care of any standard make of fan. The plate is bolted to a square pad on the cylinder block in such a way that there is more than enough metal to prevent the breaking of water jackets.

Fiat Changes Tractor

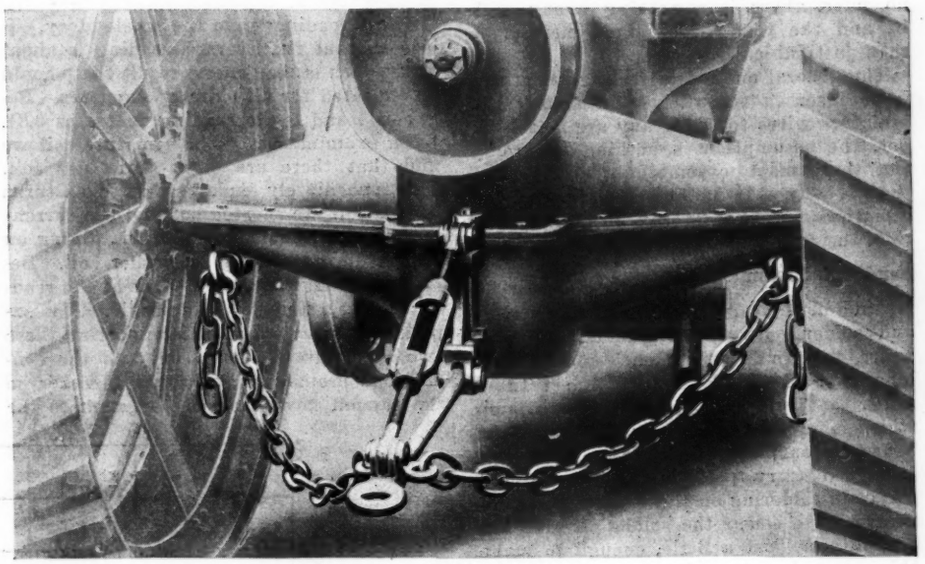
SEVERAL changes have been made in the Fiat farm tractor since it was described Nov. 14, MOTOR AGE is advised by its European correspondent, W. F. Bradley. On the original design the pulley for belt drive was mounted on the extremity of the propeller shaft, which necessitated the removal of one of the wheels when belt connection was made. To make this practicable special jacks were provided. On the machine as now produced there is a short secondary shaft immediately behind the axle housing, on which a 14-in. pulley with 7-in. face is mounted. This gives a straight belt drive and also makes it possible to tighten the belt merely by moving the tractor ahead.

The engine was originally 100 by 180 mm.—3.9 by 7.08 in.—bore and stroke. The bore has now been increased to 4.1 in. The specifications of the tractor are now as follows:

Total weight, lb.	5730
Maximum height, in.	75
Clearance, in.	15
Drawbar pull, first speed, lb.	5520
Drawbar pull, second speed, lb.	3750
Drawbar pull, third speed, lb.	2530
Wheel track, in.	52
Wheelbase, in.	68
Minimum turning radius, in.	122
Front wheel, in.	32 by 48
Rear wheel, in.	51 by 12
Engine four-cylinder 105x180, h. p.	18/25
Diameter of driving pulley, in.	14
Width of driving pulley, in.	7
Speed on first gear, m. p. h.	1.2
Speed on second gear, m. p. h.	2.8
Speed on third gear, m. p. h.	4
Reverse speed, m. p. h.	2.3
Revolutions of pulley in forward speed	100 to 750
Revolutions of pulley in reverse speed	135 to 400



As pulley now is arranged on Fiat tractor



Mounting of pulley on Fiat tractor when first brought out

National Transmissions

Two models of transmissions for passenger cars and light trucks are made by the National Tool & Mfg. Co., St. Louis, Mo. Both are of the unit powerplant type and comprise a multiple disk clutch in addition to the transmission proper. Model 25 is intended for use with engines of 25-35 hp. S. A. E. rating, and model 20 for use with engines of 18 to 25 hp. The general construction of both models is the same, and they differ only in dimensions. Clutch shaft and splined shaft are made of nickel steel and are mounted in SKF ball bearings. The gears are made of nickel steel blanks and are cut with 6-8 pitch teeth, the face width being ¾ in. in model 25 and ⅝ in. in model 20. The clutch of the larger model has twelve plates and that of the smaller one eight plates. To be able to control spinning of the clutch in changing gears, a fiber clutch brake is provided. The gear reduction ratios in model 25 are as follows: First speed, 3.04 to 1; second, 1.81 to 1; third, 1 to 1; reverse, 3.7 to 1. The ratios of model 20 are as follows: First, 2.57 to 1; second, 1.69 to 1; third, 1 to 1; reverse, 3.16 to 1. As will be seen from the illustration, the National transmission is of the selective type and is controlled by a ball-mounted, ball-ended lever, the control mechanism being carried by the top plate. The emergency brake, lever also is mounted on the transmission case.

NO RAILROAD; USE TRUCK

Wilmington, Del., March 7—Handicapped by inadequate railroad facilities, the Government three weeks ago tried the experiment of establishing a motor truck postal service between Wilmington and Salisbury, Md. While the two cities are only 100 miles apart, the route has been laid through a section of the eastern shore of Maryland which does not have direct railroad communication. Two trucks are kept so busy more will have to be added. The service is enabling the Maryland farmers to get produce to the city markets. With one relay, an exchange at Centreville, Md., the round trip is made every day between 6 a. m. and 7 p. m., with the result that the handling of the mail is not only facilitated but produce is in the markets of Wilmington, Philadelphia, New York and other cities in time for the next day's business.

TEXAS AUTHORIZES GARAGES

Austin, Tex., March 7—The Texas legislature has just passed a law authorizing the creation of private corporations for the establishment and maintenance of garages with authority to buy, sell, store, house, rent, repair and otherwise deal in motor vehicles, accessories, gasoline and oils.

The bill also allows these corporations to operate motor cars to carry freight and passengers. Regulation of jitneys, service cars, etc., however, is left in the hands of cities of the state.

The Motor Car Repair Shop

Practical Maintenance Hints

A Method for Testing Armatures

MANY ways are devised to test an armature. Some are good and require a great assortment of electrical instruments. Others are no good inasmuch as they tell nothing once the test is made. The method described herewith is one used in many factories where armature testing is part of the business.

When a man brings his car into the shop and says the generator does not charge, the first thing the electrical expert of the shop does is to connect up two wires to the generator terminals and touch them together to see if they will spark. This method does the armature no good. Apply a voltmeter, and if the generator produces no juice, there is something wrong with it, and the removal of the generator is then justifiable.

The general method of testing armatures is to insert a screwdriver in among the armature wires to see if any are loose. If not, the assumption is nothing is wrong. But there may be something wrong, and that is why this method is used. If the armature discloses nothing in an examination, the following test will tell the story:

Sand Off Commutator

Sand off the commutator with fine paper, and solder onto two segments, 180 deg. apart, two small wires, each about 3 ft. long, No. 18 or 20 gage. Connect these wires to the light source through a lamp which is in series. This can be done if the house current is D. C., otherwise a six-volt storage battery with a 16-hp. bulb will serve. In soldering on these wires, it is not necessary to smear the solder all over the commutator, just a little, enough to make this wire give a semi-permanent contact. The solder will not injure the commutator, for it can be removed easily with a knife and a little sandpaper.

Next take an ammeter, with an external shunt preferably, otherwise a milli-voltmeter must be used. Disconnect the wires from the shunt of the ammeter and connect them to the two 5-ft. flexible wires, sharp steel contacts being attached to the other ends. This makes a milli-voltmeter of the ammeter.

Place one of these contacts on the segment connected to one of the current wires, and the other contact on an adjacent segment, one immediately adjoining. If the reading of the milli-voltmeter is reversed, reverse the contacts and the reading then will be positive.

The reading the meter gives the milli-volt drop through the armature coils connecting these segments together. If the armature is a new one and everything in good condition, these readings between every adjacent pair of segments will be the same. But if one coil is shorted out, or one turn of the coil is shorted out, this method will tell.

As an example, take an armature with twelve commutator segments connected up according to these instructions. The readings between every adjacent pair of segments are taken and are:

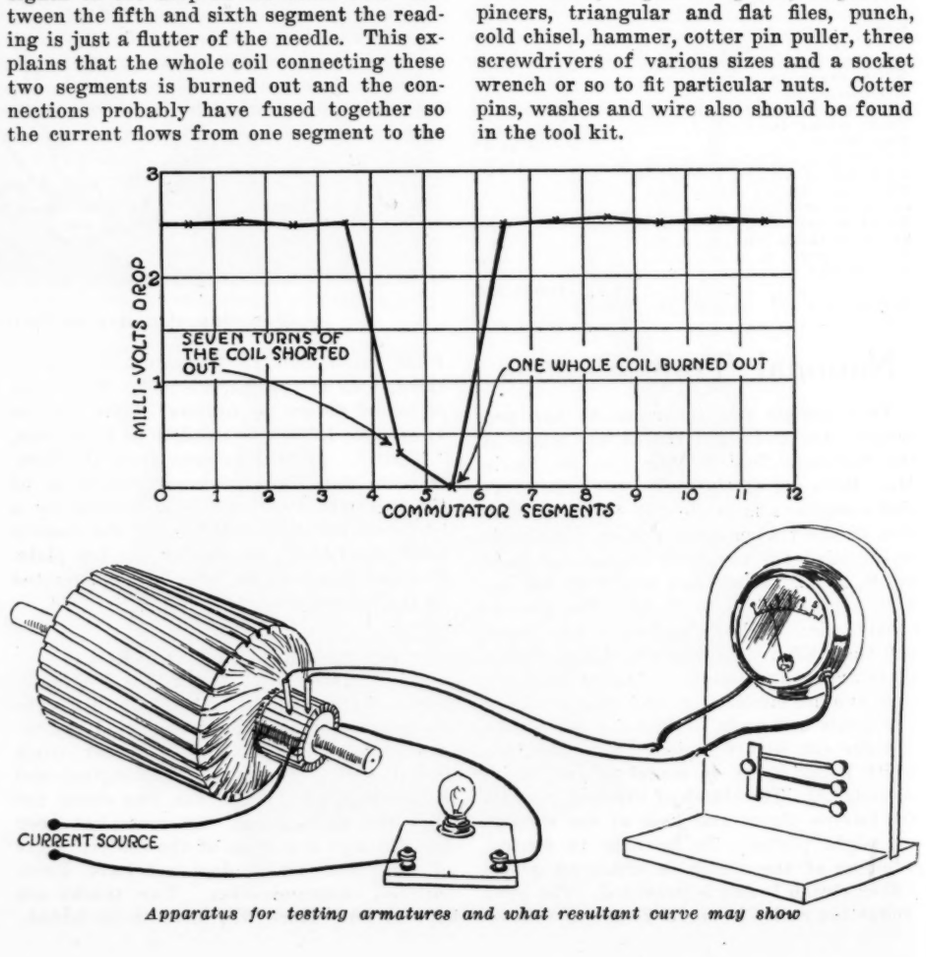
Between Segments	Milli-volt Drop
1-2	2.54
2-3	2.50
3-4	2.51
4-5	0.31
5-6	0.01
6-7	2.50
7-8	2.52
8-9	2.54
9-10	2.51
10-11	2.53
11-12	2.50
12-1	2.52

These readings give the whole story. It is seen that the average reading is about 2.52, which is the general result that should be expected for all pairs of segments. Between 4 and 5 the reading decreases 0.31. Upon examination of the armature coil we find that there are eight turns per coil. This immediately explains that seven turns of this coil are shorted out and the current is flowing through but one turn, giving an eighth of the drop in the other coil. Between the fifth and sixth segment the reading is just a flutter of the needle. This explains that the whole coil connecting these two segments is burned out and the connections probably have fused together so the current flows from one segment to the other commutator segment almost directly.

If these values are plotted, the results at once become apparent. If the curve is an almost straight line, there is no trouble in the armature. But when the curve looks as it does in our case, the analysis is an easy matter.

Tools Save Repairs

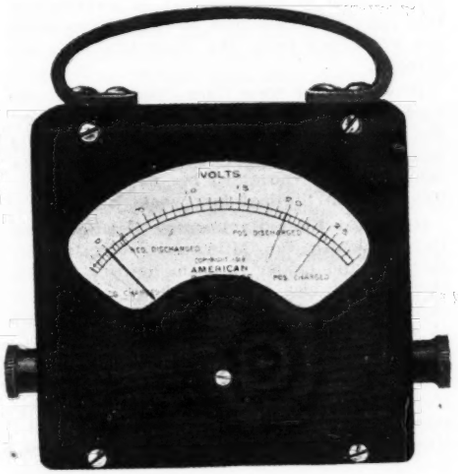
An adequate supply of tools will save much money and time. There are many things about a car that the owner can do without any trouble if he only had the proper tools, and often it is taken to a repairshop simply because he may lack a wrench or so to do the job himself. Likewise much trouble on the road may be quickly fixed if the necessary tools are to be had. So many make the mistake of trying to get along with two or three wrenches. An adequate set of tools does not mean a large set, but it does call for all the tools really needed, such as perhaps half a dozen S wrenches to fit the nuts on the car; three adjustable wrenches of different sizes, a pair of pliers, a pair of pincers, triangular and flat files, punch, cold chisel, hammer, cotter pin puller, three screwdrivers of various sizes and a socket wrench or so to fit particular nuts. Cotter pins, washes and wire also should be found in the tool kit.

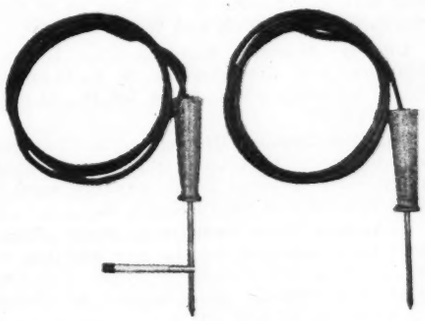


Apparatus for testing armatures and what resultant curve may show

Service Equipment

Time Savers of the Shop





Cadmium test set made by American Bureau of Engineering, including the voltmeter

Continental Engine Stands

THE Continental, made by the Continental Auto Parts Co. of Knightstown, Ind., is a stand that will fit all engines and allow the workmen to turn the engine to any desired angle. The stand is adaptable to any size of engine and any style, whether the V type or the simple four-cylinder. The stand is adjustable in two directions and clamps the engine in a balanced position so that in turning the engine very little effort is required. The stand is portable, and so adapts itself to progressive assemblies.

Respirator for Garagemen

Petromortis resulting from the fumes of the exhaust, it is claimed, is prevented by Diamond mask respirators, manufactured by the Hygeia Respirator Co., Passaic, N. J. These fumes are more deadly than ever, owing to present fuel, and in the service station, where many engines are being run and the ventilation is at best poor, it seems some precautions for the safety of the men are necessary. One of the undesirable features of respirators has been the dead air left in the pocket after exhalation, but in this one, it is claimed, the difficulty is overcome.

Time Savers for Repairman

For the shop making extensive repairs on storage batteries, the American Bureau of Engineering, Chicago, is making a variety of devices. First there is the battery carrier, a handle attached to the end handles on the battery to enable a man to carry the heavy battery easily. Then there is a cadmium test set that provides easy testing of the plates without taking the battery apart. The set consists of a set of terminals with a chemically pure cadmium test point on one of the leads. The lead wires are 5 ft., with special forked connectors for quick attachment to the voltmeter. A special voltmeter has been brought out for the cadmium test. Its price is $22.50, and with the test terminals, $25. The same company makes the Ambu battery turntable for bench work. A battery steamer is another one of the shop aids. Its feature is in the small amount of water heated, making steam raising easy and also very rapid. A float in the supply tank keeps the water level constant in the boiler. The steaming box is made acid proof inside and out. A plate press for forcing the material into the grids of the plates is made also. Its price is $32.50.

Brady Measuring System

The Brady is a complete gasoline dispensing outfit consisting of pump, tank and all necessary equipment. The gasoline is not pumped directly from the tank to the car but first is pumped into an overhead tank, which has a glass gage on the outside calibrated in gallons. This tank holds 10 gal., and upon being filled any amount can be run from the tank to the car by turning a valve. Gravity is utilized to effect this transfer. The entire system, with the exception of the tank, is inclosed in a curb box complete with electric light, hose and other necessities. The price with 250-gal. tank is $385. Another model is to be had equipped with an electric pump in place of the hand pump. They are made by the Gasoline Dispenser Co. of America, Inc., Louisville, Ky.

On the Shelves of the Motorist's Bookman

INVENTOR'S MANUAL

The "Inventor's Manual" by George M. Hopkins is published by the Norman W. Henley Publishing Co., New York. The book is a guide for inventors which will enable them to secure patents on their inventions. It explains the precautionary measures to take in protecting the invention, both from infringement suits in court and from the unscrupulous patent attorney. The regular methods of procedure in assigning parts or the whole of the invention are given, together with the necessary style of form.

NEW BOOK ON IGNITION

R. C. Fryer's new book on "Automotive Starting, Lighting and Ignition" is intended primarily for classroom work, and forms the basis for a lecture course on the subject. The fundamental principles of electricity first are taken up, and the effects of magnetism are explained. Then the elements of electricity are applied to the simple circuits in use on the motor car. The different systems of ignition are taken up singly and their principle of operation discussed. A valuable collection of the wiring diagrams of all the different systems as used in many models of machines are printed in conjunction with a table of firing orders and magneto settings of the leading makes of cars. The book has 210 pages and is cloth bound, selling for $1.25. John Wiley & Son are the publishers.

THE A-B-C OF AVIATION

Capt. Victor W. Page, late chief engineer officer of the U. S. Army school of aviation at the Mineola field, Long Island, has just had published by the W. Henly Publishing Co. of New York, the 1918 edition of his book on aviation. The book is a treatise on the elements of aeronautical engineering, as applied to the heavier-than-air machines and those employing gas for the lifting power. The subject of air-dynamics and the theory of flight is gone into in a manner that makes the book valuable to the student at home or in school. One of the appealing features of the book is the simple non-technical manner in which all the subject matter is explained.

THE FLYING BOOK

The 1918 edition of "The Aviation World Who's Who and Industrial Directory," has now been announced by the Longmans, Green & Co., publishers of London. The book is edited by W. L. Wade, who was assisted in the collecting of data by the editor of The Aeroplane, C. C. Grey. The contents of the book is divided into three parts. Part I takes up a few special articles. The airplane and its adaptation to war on land and sea and the application to commercial purposes are treated in the opening pages of the book. An industrial directory of airplane manufacturers and airplane engine manufacturers, which illustrates and gives the specifications of the makers' products, makes the book very valuable to those in the business. A chapter is devoted to the men who have been instrumental in the developing of the airplane.

Among the Makers and Dealers

Short Trade Notes

CLINGAN with Bock Bearing—R. E. Clingan is now sales manager of the Bock Bearing division of the Standard Parts Co., Cleveland, Ohio. Mr. Clingan was formerly with Hess Bright.

Jewell with Studebaker at Detroit—W. S. Jewell, former retail manager of the New York branch of the Studebaker Corp., is now retail manager of the Detroit distributing branch of this company.

Hepburn to Direct Sales—C. F. Hepburn has been appointed director of sales for the Torbensen Axle Co., Cleveland, Ohio. For the last year and a half he was a major in the Ordnance Department.

Stromberg Declares Extra Dividend—The Stromberg Motor Devices Co., Chicago, has declared an extra dividend of 25 cents a share in addition to the regular quarterly dividend of 75 cents a share, payable April 1 to stockholders of record March 15.

Clover Opens Western Branch—The Clover Mfg. Co., Norwalk Conn., has opened a branch in San Francisco, Cal. A carload of Clover grinding compound has been placed in stock and shipments to all points west of the Rockies will be made from there in the future.

Western Carburetor Reorganizes—The Western Carburetor Co., Alma, Mich., is being reorganized and will resume operations soon. The capital stock of the company, which is $120,000, will not be increased for the present. Henry Prescott has been made superintendent and sales manager.

Kline Now with Packard—Harmon J. Kline, formerly designing engineer with the Olds Motor Works, Lansing, Mich., has been released from the service where he was a lieutenant in the Ordnance Department, and has joined the engineering staff of the Packard Motor Car Co.

Erdman-Guider Expands Facilities—The Erdman-Guider Co., Detroit, is enlarging its present plan and has established a service station giving double the former facilities for repairing and repainting motor cars. The company produces custom-made bodies and tops.

McMullen Becomes a Distributer—B. J. McMullen, general sales manager of the Chevrolet Motor Car Co., Flint, Mich., has resigned to enter into business for himself in Minneapolis, in which territory he will distribute Republic trucks. C. C. Meade who was assistant to Mr. McMullen, succeeds him as general sales manager.

Dual Truck Leases Plant—The Dual Truck & Tractor Co., Decatur, Ill., has closed a lease for a plant and will make trucks and tractors. The building is of brick, with two stories and a basement. It is expected the alterations of the building and installation of necessary machinery will be completed by May 1.

New Baker & Lockwood Branch—The Baker & Lockwood Mfg. Co., Kansas City, Mo., has decided to operate a branch factory in New York to take care of the fast-growing eastern trade. W. C. Somerville, vice-president, and R. M. Sedor, sales manager, will leave Kansas City shortly to take the management of the New York factory and sales office. The Baker & Lockwood Mfg. Co. is a well-established concern of fifty years' standing, well known to the western trade, and now proposes to make its products as widely and favorably known in the East as is now the case in the Middle and Western states.

Liberty Starters Building—The Liberty Starters Corp., Poughkeepsie, N. Y., is erecting a one-story plant, 60 by 200 ft., to cost about $50,000.

Chandler Declares Dividend—The Chandler Motor Car Co., Cleveland, Ohio, has declared a quarterly dividend of $3, payable April 1 to stockholders of record March 11.

Commerce Plans Addition to Plant—Plans have been approved for the new addition to the plant of the Commerce Motor Car Co. With this building the company will have 100 000 sq. ft. of floor space.

Vinton Leaves National—Almus E. Vinton, for ten years assistant sales manager of the National Motor Car & Vehicle Corp., has become sales manager of the New Jersey Car Spring & Rubber Co., Jersey City, N. J.

Republic Rubber Promotes Bartlett—L. M. Bartlett, who has been representative in Kansas City, Mo., for the Republic Rubber Co., has been made district manager at St. Louis, Mo., for that company.

Chevrolet Men Are Transferred—L. K. Cooper, who has been sales manager for the Chevrolet Motor Co., St. Louis, Mo., has been transferred to New York and is succeeded in St. Louis by F. N. Coates of Minneapolis, Minn., who has been connected with the Chevrolet distribution in that city.

Products for Automotive Industry—The Automatic Products Co., Detroit, which specializes in the manufacture of cap screws and other special screw machine parts, this year will devote its entire capacity to the automotive industry, and has completed a production schedule which calls for the manufacture of its type of material for 500,000 cars. During 1918 over 65,000,000 pieces were produced, a large percentage of which was used in the assembly of airplanes. This company made approximately 80 per cent of the cap screws used in the assembly of airplanes in this country. This type of cap screws made are all milled from the steel bar with cut threads.

Driveaway of New Cars—The force of the Paige-Overland Co., headed by Earl Paige has arrived in Port Huron, Mich., with eighteen cars from the Overland factory in Toledo. This is the third big drive the force has made in the last few weeks.

Universal Files Bankruptcy Petition—The Universal Mfg. Co. Milwaukee, Wis., manufacturer and dealer in farm lighting plants, electrical devices and specialties, has filed a petition in bankruptcy, scheduling liabilities at $23,820 and assets at $21,912. Julius J. Goetz is trustee.

Marathon Holds Sales Convention—The Marathon Tire & Rubber Co. held its annual sales representatives' convention in Boston, Mass. This was one of many territorial conventions held by the company as a regular feature of its get-together program. W. H. Jenks, president, and R. D. Jenks, secretary and sales manager, were present.

McGraw Moves General Offices—The executive and general offices of the McGraw Tire & Rubber Co. have been transferred from East Palestine to Cleveland Ohio. A sales department will be maintained to serve local passenger car and motor truck tire customers. The company's factories at East Palestine are engaged exclusively in the production of pneumatic fabrics, cord and solid truck tires. Production plans call for an expansion from 5000 to 10,000 tires and tubes daily.

Hewitt Rubber Expanding Facilities—One complete building has just been completed and a three-story addition to another at the Buffalo plant of the Hewitt Rubber Co. is nearing completion, these additions having been made necessary by the company's increased business. Six new tire heaters, each weighing nearly 10 tons, have been installed and forty new tire-making machines have

IT CAN'T COME UP TO OURS—Here is a cam ouflaged German truck which shows itself much the worse for wear. Also it shows how much better work our truck makers turn out

been purchased. The Hewitt tube plant will also be enlarged. The company makes Hewitt fabric and cord tires as well as solid truck tires.

Thompson Now with Republic—Loyal E. Thompson, formerly connected with the service department of the Cadillac Motor Car Co., has been made assistant manager of the service department of the Republic Motor Truck Co., Alma, Mich.

Jalagas with Kansas City Concern—L. F. Jalagas, formerly in the wholesale sales department of the Reo branch in Chicago, has become wholesale manager for the Southwest Motor Co., Kansas City, Mo., distributer of Reo and Jordan cars.

Commerce Declares Dividend—The Commerce Motor Car Co., Detroit, has declared a 1½ per cent dividend on its capital stock, payable to stockholders of record on April 1, and 1 per cent extra dividend, payable to stockholders of record April 1.

Cleveland Company Buys Land—The Cleveland Automobile Co., recently organized by Chandler interests, has purchased a 19-acre tract of land for its new plant. The consideration was $215,000. Work will commence at once on a $40,000 factory covering 5 acres. The capacity of the new plant will be 150 cars a day.

Rotary Tire Erects Plant—The Rotary Tire & Rubber Co. has completed the erection of its tire manufacturing plant at Zanesville, Ohio. This has been under construction for more than a year. The plant is expected to be in operation within sixty days. It is planned to manufacture 100 casings and 100 inner tubes a day from the start.

Ohio Dealers' and Salesmen Convention—The second annual dealers' and salesmen convention was held in Columbus, Ohio, recently. Many accessory manufacturers have exhibits. While the event was under the auspices of the Griswold-Sohl Co., jobbers of automotive equipment, garagemen and dealers in all sections of the state were invited to attend.

Service for Batteries Exclusively—The Madison Battery & Service Co., Madison, Wis., has broken ground for a new headquarters and service building which will be one of the largest in Wisconsin devoted to the construction, repair and charging of storage batteries exclusively. The building will be 60 by 95 ft., two stories high, of fireproof construction and cost $25,000.

McQuay-Norris Will Build—The McQuay-Norris Mfg. Co., St. Louis, Mo., has bought a 5-acre factory site which will be improved as soon as possible with a one-story building to house this company's piston ring plant. This site is a considerable distance from the central part of the city but in a manufacturing district. The company has been hampered for a long time for space and the present factory building has been extended from time to time.

Bishop Will Distribute Nashes—R. P. Bishop has resigned as assistant sales manager of the Nash Motors Co. and will distribute Nash cars and trucks under the firm name of the Nash Saginaw Motors Co., at Saginaw, Mich. L. A. Wilson, who was also identified with the Nash factory, is his partner. W. W. Smith has been appointed manager of passenger car sales to succeed Mr. Bishop. He has been with the factory for the last two years.

Toledo Has Motor Department Store—W. S. Arbogast will open Toledo's first motor car department store soon. He has closed a lease for a six-floor structure and will move in April 1. He proposes to operate a place where under one roof the motorist can buy anything for his car, get any kind of repairs for any part of his machine and get any kind of motor car. The establishment will be divided into ten departments, and as expansion necessitates new departments will be added.

White Opens New Service Station—The White Co. has opened a large new service station in Philadelphia, Pa., as a part of its present branch in that city. The service station is said to be one of the largest in the country.

Buckwalter Heads Ambu—C. J. Buckwalter, manager of the American Bureau of Engineering, Chicago, has been elected president. The success of the company has been due very largely to his foresight and to his insight into the needs of the garage and repairshop, it is said.

Page Now with Commerce—Robert E. Page, for four and a half years assistant foreign sales manager for Dodge Brothers, has joined the Commerce Motor Car Co. and will be district sales manager for Commerce trucks in Canada.

Specialty Products Doubles Space—The Specialty Products Co. has completed plans for a new building which will double the present plant. At the present time the parts manufactured by this company are sold through jobbers and accessory houses. With the completion of the new addition the concern will market its own products.

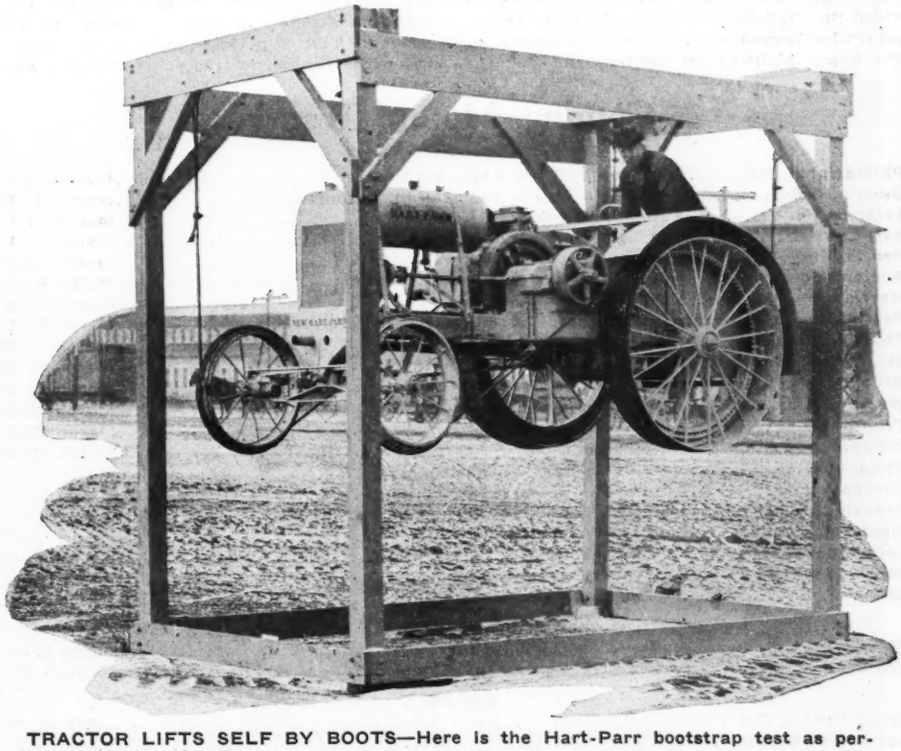
Holmes Recovers from Fire—The Holmes Foundry Co., Port Huron, Mich., whose big south end plant was wiped out by fire, is rebuilding and hopes to resume production within sixty days. To meet the demands of General Motors and other automotive companies the company has increased its production at its north end plant to 60 tons of steel castings daily. This company has casting contracts with General Motors which call for its entire output and to accommodate its other business two more foundries will be built. Both will be complete and in full operation before 1920. The fire will not cause a serious tie-up in contract work, inasmuch as the company was sixty days ahead of its production schedule. To permit its entrance into the Canadian field, the Holmes Foundry Co. is now building a plant at Sarnia, Ont., just across the river. Another big plant is being built at Mount Clemens.

Flechter Opens Another Branch—L. V. Flechter & Co., New York, have opened a branch in Los Angeles, Cal., with M. J. Siebert as manager. At the same time J. J. Frank, formerly owner of a large service and repair business in New York, was appointed district manager of sales in the Metropolitan district.

Miniger Leaves Willys-Overland—G. O. Miniger, vice president in charge of production for Willys-Overland, retired March 1. He will be succeeded by Leroy Kramer, for many years vice-president in charge of production for the Pullman company of Chicago. C. R. Miller, former assistant to the vice-president of Willys-Overland, has been appointed works manager for the factory.

Superb Adds to Plant—The Superb Mfg. Co., Inc., Monticello, Ind., is adding 20,000 sq. ft. additional floor space to its present plant facilities. This company will bring out a line of light and heavy trailers and expects to be in production on the latter within the next sixty days. This is in addition to its regular line of motor car and truck parts and accessories.

One of Largest Tractor Schools—The three-day Avery tractor device school held recently at the Aberdeen, S. D., branch was one of the largest ever held, with an average attendance for each of the three days of 400. The attendance the second day was the largest ever held at such a lecture it is believed. Nearly 500 were present. Despite bad weather conditions this was one of the largest of the 600 service schools Avery has held during the last winter in this country and Canada.



TRACTOR LIFTS SELF BY BOOTS—Here is the Hart-Parr bootstrap test as performed at Kansas City. A heavy four-posted frame is provided, braced to prevent collapse. Under this framework the tractor is placed, then heavy wire cables are bolted through the rim, one to each drive wheel. The upper end of the cable is fastened securely to the upper rear crossbar. As the drive wheels turn the cable winds up on the face of the wheels as a rope on a capstan. This raises the tractor off the ground, a distance limited only by the height of the frame and the length of the cable. Two more cables, each one passing under the front wheels with grooves to prevent slipping, enable the tractor to ascend and descend. The engine is kept in motion during all stages

From the Four Winds

Glimpses at the World of Motordom

STEALING Car a Felony — Joy-riding in stolen cars in the future will not be as attractive in Washington. The state senate has passed a bill which makes it a felony to steal a car. At the same time the bill makes all persons riding in the stolen car equally guilty.

State to License Mechanics—A board of examiners for motor mechanics has been named by the Oregon legislature. The board will be appointed by the governor to consist of three examiners, who will examine all mechanics and issue licenses for a fee of $5 a year.

No Money; No Post Roads—The announcement comes out of Washington that all of the post motor truck routes in Ohio are to be abandoned because of a cut in the appropriation from $1,000,000 to $300,000. The routes that will go are the ones from Columbus to Cincinnati, Columbus to Zanesville and Zanesville to Wheeling.

Washington Considers Horsepower Tax—Further amendments have been written into the Oregon license tax bill, which include increasing the license tax on cars to an extent which will add an additional $400,000 to the state's funds. For motor vehicles up to and including 23 hp., $15; for those up to 26 hp., $22; 30 hp., $28; 36 hp., $36; 40 hp., $48; in excess of 40 hp., $56.

Ohio May Reorganize Road Department—Reorganization of the Ohio highway department and an increase in the state levy for road improvement and maintenance are provided in a bill introduced in the Ohio Legislature by Representative Fouts, chairman of the house highway committee, and Senator Busbey, chairman of the senate highway committee. The bill would abolish the present non-salaried advisory board and increase the salaries of the commissioners and his chief assistants. The bill seeks to add more than $2,000,000 to the annual levy for road improvement.

Taking Time by the Propeller—Members of the East Aurora, N. Y., Country Club believe in taking time by the forelock. At their next meeting they will take up the matter of providing land space for airplanes on the club grounds. It is probable one of four long fairways included in the golf course will be used for this purpose. Some members of the club, it is understood, are planning to buy airplanes and have asked the club to consider plans for making it possible to alight on the club grounds.

Tractor Furnishes Sawmill Power—An unusual demonstration of the uses to which a tractor may be put was made at the plant of the Deppe-Carpenter Lumber & Produce Co., Baraboo, Wis., where huge logs are being sawed lengthwise with power derived from a pulley attached to a tractor. The Deppe-Carpenter company operates a small sawmill and recently acquired 12 acres of pine timber several miles from the city. To reduce the huge logs to lumber presented difficulties. The Prothero-McGinnis Auto Co., Baraboo dealer in the Lauson tractor, offered its assistance by suggesting that one of these machines be taken to the center of the logging operations and the logs sawed on the ground. Thus a portable sawmill was rigged up, with a kerosene tractor as motive power for the large circular saw. As soon as all the logs are sawed the tractor will be put to use as motive power for hauling the manufactured lumber to Baraboo.

Trucks Salvage Ship's Cargo—A novel means to salvage part of the cargo of the British power schooner Janet Carruthers, ashore near Grays Harbor, has been adopted by the salvage operators. Experiments have been made to prove that at low tide motor trucks can reach the stranded vessel, the sands offering firm traction for heavy vehicles. Trucks have been engaged to run out over the land beach to the ship and haul the cargo of fuel oil ashore. Upwards of 7000 gal. of oil will be moved. This is valued at $2 a gallon.

Taximen Would Raise License Fee—The large taxicab concerns of Wilmington, Del., have joined in a petition to the city council to require a license of $100 a year to engage in the taxicab business. This sounds good to the ears of the councilmen, except that they have no legal authority to impose the license. So it has been suggested by the taximen that they get authority from the legislature, now in session, which they probably will do. The purpose of the license is to keep irresponsible car owners and operators out of the field, thereby protecting the public.

Testing Garage Building Ordinance—The courts are going to be called upon to pass upon the legality of an ordinance of Wilmington, Del., which prohibits the erection of a public garage within 40 ft. of another property without the consent of the owner of the latter. A garageman has been arrested on this charge after the city council had revoked a permit. In the city court he was fined $1, but his attorney has taken the case to the state courts on an appeal. This same law is halting F. B. Norman, local agent for the Ford car, from occupying the old Hammond rink, a large building which he leased in connection with his business.

Road Work in Pennsylvania—Much road building in Pennsylvania depends on the action of the New York state highway department and Cattaraugus county board of supervisors upon a proposed improvement of the road between Portsville, N. Y. and the Pennsylvania state line. If this road is constructed McKean county, Pa., will build an improved road from Larabee to the New York state line, and if this is done Pennsylvania will improve the read from Port Allegany to Smethport by way of Larabee. If these proposed highways are built, the state highways of the two states will be connected.

Ohio Would Tax by Horsepower—The special taxation committee of the Ohio general assembly is working on a plan to tax by horsepower and also to avoid the constitutional provision prohibiting double taxation. The plan as worked out provides that the car shall be valued at its true worth and after deducting the usual taxes any excess computed on the horsepower basis can be collected. The committee apparently is determined to obtain more revenue from motors, for road repair and maintainance. All previous efforts to enforce a license lay based on horsepower have failed because of constitutional reasons. Several years ago a bill of that character was passed but was held unconstitutional.

Coming Motor Events

SHOWS

Philadelphia, Pa.	Automobile Trade Association, cars	March 8-15
Omaha, Neb.	Automobile Trade Association, automotive	March 10-15
Syracuse, N. Y.	Automobile Dealers' Association	March 10-15
Salt Lake City, Utah.	Salt Lake Auto Show	March 10-15
Peoria, Ill.		March 12-15
Boston, Mass.	Automobile Dealers' Association, cars	March 15-22
Harrisburg, Pa.	Motor Dealers' Association	March 15-22
Peoria, Ill.		March 17-18
Philadelphia, Pa.	Motor Truck Association, trucks	March 17-22
St. Joseph, Mo.	Automobile Show Association	March 19-22
Brooklyn, N. Y.	Motor Vehicle Dealers' Association, cars	March 22-29
Warren, Pa.	Automobile Dealers' Association	March 22-29
Trenton, N. J.	Auto Trade Association	March 22-29
Pittsburgh, Pa.	Automobile Dealers' Association	March 22-29
Utica, N. Y.	Motor Dealers' Association	March 24-29
Clinton, Iowa	Automobile Dealers' Association	March 26-29
Brooklyn, N. Y.	Motor Vehicle Dealers' Association, trucks	April 1-5
Montreal, Canada	Soldiers' Wives' League	April 5-12
Bridgeton, Conn.	Automobile Dealers' Association	April 5-12
Deadwood, S. D.	Deadwood Business Club	April 8-12
Bristol, Va.		May 10-17

MEETINGS

Chicago	National Petroleum Congress	March 25-28
Hot Springs, Va.	Automotive Equipment Association	June 2-6

RACES

Santa Monica, Cal.	March 15
Los Angeles, Cal.	March 23
Indianapolis, Ind.	May 31
Uniontown, Pa.	July 19
New York	July 26
Elgin, Ill.	Aug. 22-23
New York	Aug. 23
Uniontown, Pa.	Sept. 1
New York	Sept. 20
Cincinnati, Ohio	Oct. 1